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electron user NEWS

Top people read their monitor...

THE world's leading financial newspaper – America's famous Wall Street Journal – is now available daily on the Electron.

This latest service from MicroLink provides an authoritative, up-to-date source of financial and business news. There is also a facility to search through issues dating back to 1986.

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Testimony to Acorn popularity . . . waiting for the show to open

New products give Electron a boost

THE wealth of exciting accessories and upgrades pouring on to the Electron market continues unabated.

This was never more evident than at the Electron & BBC Micro User Show in Manchester where, for example, Pres – which has taken over where ACP left off – launched no less than nine Electron products and gave a promise of more to come.

One of the debutant upgrades – the Advanced Plus 2 Rom – contains no less than 21 helpful utilities for owners of Electron add-ons. Also just off the Pres assembly line are a new power switch, user port, 1MHz bus, advanced printer buffer, enhanced ABR software and – as a change of pace – three volumes of games on disc.

The company has also brought out ADFS Version 1.1 and ADFS E00 for Plus 3 and AP4 users. Coming soon are internal battery-backed ram upgrade Advanced Plus 7 and Advanced Basic Editor+.

"Most users tell us how delighted they are with their Electron, but ask if it is still worthwhile upgrading or should they change to a second-hand BBC Micro or Master 128", a Pres spokesman told *Electron User*.

"We try to remove any doubts by designing, where possible, products that Electron owners can use with other Acorn computers".

Meanwhile, sources close to Slogger say the firm is developing for release in the autumn a souped up rom box that will give the Electron "everything the BBC Micro has got including rom cartridge sockets, RS423, user port, 1MHz bus and printer sockets".

And hopes are high that Slogger will take over production of Pace Micro Technology's RS423 interface for the Electron.

The Manchester show proved once again that there is still plenty of computing left in the Electron. Despite unpleasant weather, crowds exceeded expectations with queues stretching right round UMIST and the doors having to be closed several times.

Visitors praised the high quality of the re-introduced seminars and enjoyed the Treasure Hunt with its more than 150 prizes.

The next Electron & BBC Micro User Show takes place at the New Horticultural Hall, Westminster, London, from May 13 to 15. Ticket details are on Page 4.

Flip look at floppies

A FREE booklet which takes a lighthearted look at floppy discs and data storage has been published by Fuji Photo Film.

Called The Floppy Disc story, it explains how to protect discs and get the best from them.

Richard Ferrand, Fuji's sales and marketing manager said: "Although floppy discs are now a familiar part of computing, people still need to be educated on how and why they should be cared for".

The booklet can be obtained from Fuji Photo Film UK (01-586 5900).

Winner collects his prize

Winner James in Calgary

WINNER of Tynesoft's massive Winter Olympiad competition which attracted thousands of entries from all over Europe was young Electron owner James Yerkess.

The competition, which ran concurrently in the UK and Europe, was open to all users of Winter Olympiad 88, regardless of machine.

James successfully listed the attributes that go to make a perfect skier, winning through a tiebreaker in the face of stiff opposition.

His reward was an all-expenses-paid trip for two to the winter olympics in Calgary.

In his seven days there he managed to take in most of the major events, as well as finding time to see the sights.

Back home, 16-year-old James spends a lot of time with his Electron – despite the fact that his computer studies teacher swears by the BBC Micro.

"After my success, however, he might just change his opinion that you can't do much on an Electron", said James.

Heidi Kinseler at the show

Electron's a hit

THE Electron is a big hit with physically handicapped members of the Newbridge Resource Centre in Stockport.

The centre was among many groups from schools and organisations which visited the Electron & BBC Micro User Show in Manchester.

One of the members, Heidi Kinseler – who suffers from spina bifida – was particularly impressed by the Fun School program which features 10 games to help the learning process.

"I was surprised to see how easy the Electron is to use", said Heidi. "We have a computer at the resource centre but there are so many people who want to use it that it was a nice change to be able to have a machine to myself" she added.

The Newbridge centre was founded two years ago to help the physically handicapped achieve their full learning potential.

Courses in typing and computer programming are all carried out on a single machine which is causing a bit of a backlog for enthusiastic students who want to use it.

Currently the centre is trying to provide more computers for its members to use, but cost is a major problem.

"We were persuaded to go along to the show by one of our members, Gavin Key, who is just crazy about the Electron", said Gail Godfrey.

THE GALLUP CHART TOP 10

ELECTRON SOFTWARE

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2	6	STAR FIGHT *Alternative*	1.99
3	2	SOCCER BOSS *Alternative*	1.99
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6	5	FOUR GREAT GAMES *Micro Value*	3.99
7	•	THAI BOXING *Anco*	5.95
8	4	AROUND THE WORLD IN 40 SCREENS *Superior*	6.95
9	•	PLAY IT AGAIN SAM 2 *Superior*	9.95
10	7	SUPERIOR COLLECTION VOL 3 *Superior*	9.95

Compiled by Gallup/Microscope

The chart is quite static this month which is expected at this time of the year. However, there are three new entries – Thai Boxing is an old title from Anco and enters at number seven, while Superior's Play it Again Sam 2 enters in ninth position. Highest entry is the budget priced Pro-Golf from Atlantis. Yet the budget label with the first three spots is Alternative. Superior Software hold the bottom of the chart with its full-priced compilations.

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MACHINE CODE

It's routine work

Get to grips with operating system routines in Part 3 of PETE BIBBY's beginner's machine code tutorial

LOTS to do this month, so straight down to work with Program I. Before you say "Oh no, not more of that beeping code", take another look at it – it's changed:

```
10 REM Program I
20 MODE 6
30 P%=&2000
40 [ \ enter the assembler
50 LDA #7 \ put 7 in the acc
umulator
60 JSR &FFEE \ invoke a subr
outine
70 RTS \ go back to basic
80 ] REM leave the assembler
90 CALL &2000
```

The difference lies in the comments attached to each mnemonic. These comments come after the backslash \, which is the assembler equivalent of Basic's REM.

Take my advice and use comments liberally. If you don't, assembly language programs rapidly become unintelligible.

Notice that the comments also appear in the assembly listing produced. Figure I shows what each field in the listing contains.

Not that I'm obsessed with beeps, or afraid that you might fall asleep reading this, but Program II produces another beep. And while the code produced is the same, the techniques used to produce it are very different and well worth getting into the habit of using:

```
10 REM Program II
20 MODE 6
23 codeStart=&2000
25 number=7
27 oswrch=&FFEE
30 P%=codeStart
40 [ \ enter the assembler
45 .start
50 LDA #number \ put 7 in th
e accumulator
60 JSR oswrch
70 RTS \ go back to basic
80 ] REM leave the assembler
90 CALL codeStart
```

For a start, three new lines are squeezed in between lines 20 and 30. The first – line 23 – sets up a variable *codeStart* which holds the address of the first location you want the code to be assembled at. Later on *P%* is set to this address.

The next variable, *number*, holds seven, the bell code. Finally, the address of our tame operating system – or os – routine is held in the strangely named variable *oswrch*.

Actually there's good reason for calling it *oswrch*, as the routine at &FFEE is known as oswrch – Operating System call to WRite a CHaracter.

These variables are then used with our familiar assembly language mnemonics. Line 50 now LDAs *number* rather than 7, while line 60 JSRs to *oswrch*. And once we leave the assembler we find that the CALL is to *codeStart*.

Using these variables makes the mnemonics more intelligible and flexible. To see what I mean try changing where the code starts. You could have *codeStart* as &2100 or &2200 or whatever.

Just be wary that you don't go into areas of memory used by the operating system or Basic. You'll soon know if you do!

Still ringing the changes, try using other values for *number* such as 65 or 66. You'll see that what oswrch does depends on the value in the accumulator.

Experiment with these, but avoid the values below 32; these are control codes and can cause odd things to happen if you don't know what you're doing.

One other technique is introduced in Program II. This is labelling assembly code. Line 45 introduces our label, *start*, using a dot to tell the assembler that this is a label.

When the assembler comes across this it makes a note of the location it's up to and whenever it comes across *start* again it knows that it refers to this address.

In this case the label is at the beginning of the code and we've told the assembler (via *codeStart* and *P%*) to start the code at location &2000.

Hence *start* takes the value &2000 and you could, if you wanted, use the line:

```
90 CALL start
```

to get the routine working.

Notice that you don't need the leading dot, that's just there when it's initially used. The rules for labels are the same as for variable names, and it is good advice to use meaningful ones.

One last thing about labels: The assembler uses them but they don't appear in the opcodes produced. They're just notes used at the time of assembly to help the assembler keep track of the locations involved in a routine. Look at Program II's assembly listing if you don't believe me.

Also note that *number* and *codeStart* don't appear

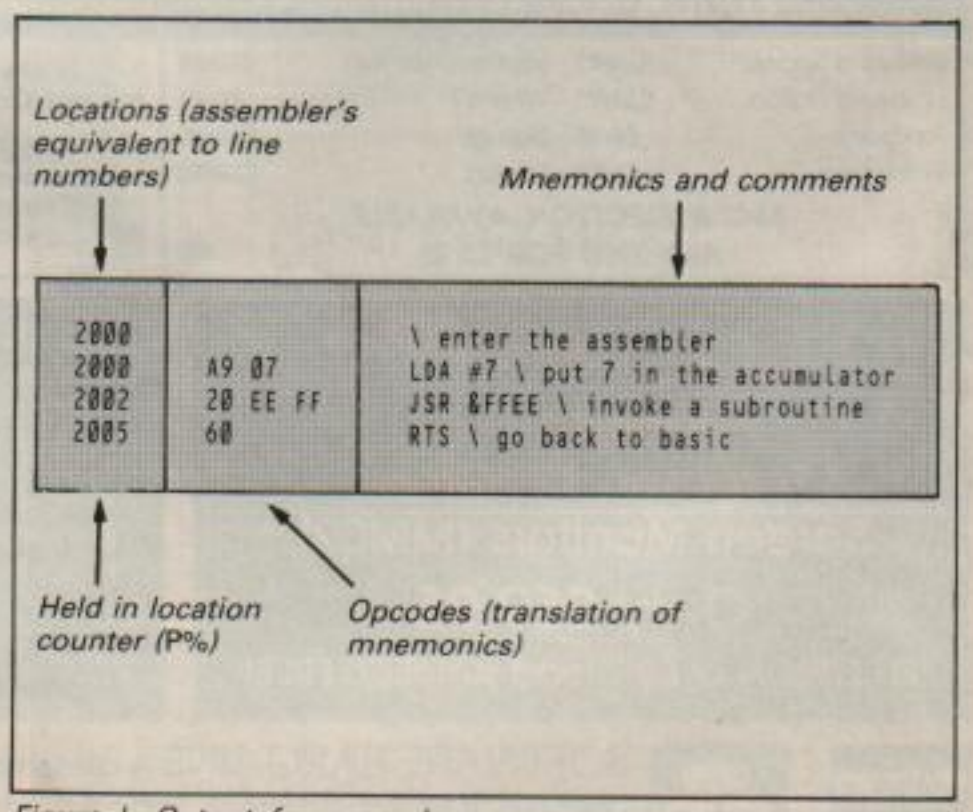


Figure I: Output from running Program I. What each bit means

in the opcodes, the assembler substitutes 7 and &FFEE (in the annoying about-face style that the 6502 uses for addresses).

Because of this, the actual code produced by Programs I and II is exactly the same, despite the obvious differences in appearance of the two.

I leave it to you to decide which is the more intelligible program.

Program III shouldn't detain you for too long. It's as easy as ABC. However, there's a lot to learn from it if you're willing to spend some time messing about with the code:

```
10 REM Program III
20 MODE 6
30 codeStart=&2000
40 number=65
50 oswrch=&FFEE
60 P%=codeStart
70 [ \ enter the assembler
80 .A
90 LDA #number \ put 65 in t
he accumulator
100 JSR oswrch \ displays A
110 .B
120 LDA #number+1 \ put 66 i
n the accumulator
130 JSR oswrch \ displays B
140 .C
150 LDA #number+2 \ put 67 i
n the accumulator
160 JSR oswrch \ displays C
170 RTS \ go back to basic
180 ] REM leave assembler
190 CALL codeStart
```

For a start, lines 120 and 150 show that you can use expressions inside the assembler, which is quite clever enough to calculate *number*+1 and substitute that value in the code produced.

You can even use Basic functions, as you'll see if you make line 90:

```
LDA #ASC("A")
```

Observant readers will see that I've used three labels, *A*, *B* and *C*. What do you think will happen if you use CALL *C* or CALL *B* or CALL *A* in line 190? Try it and see.

Program IV uses assembly language to look at the keyboard, and echo the key you press to the screen. To do this it employs three os routines:

```
10 REM Program IV
20 MODE 6
30 codeStart=&2000
40 P%=codeStart
50 osrdch=&FFE0
60 oswrch=&FFEE
70 osnewl=&FFE7
80 [ \ enter the assembler
90 JSR osrdch \ get keyboard
 character
100 JSR oswrch \ display thi
s character
110 JSR osnewl
120 RTS \ go back to basic
130 ] REM leave assembler
140 CALL &2000
```

The first is osrdch – ReaD CHaracter. Found at address &FFE0, this routine examines the keyboard and places the Ascii value of the key pressed into the accumulator.

Oswrch we've met before. The third routine is osnewl, which you can contact via &FFE7. This provides a carriage return and a line feed giving, in effect, a new line. Leave out line 110 and see what happens.

Readers of an ingenious and inquiring mind with a knowledge of some of those control codes may wonder

Turn to Page 10 ▶

Memories are made of this ...

A quick way of seeing what's in location &2000 and its successors is to set up a function key to do the job. Just enter:

```
* KEY 1 X=&2000:FOR I=0 TO 8
:PRINT ~X+1, ~X?I:NEXT I|M|G
```

Now whenever you press function key 1, the contents of locations &2000 to &2008 are displayed, along with the seemingly obligatory beep.

A question of ?

Most Basics allow you to examine the contents of a location or change its value. Electron Basic does the same, only it replaces the usual PEEK and POKE with the rather more sophisticated indirection operators ?, ! and $.

The ? operator stands for the "contents of location" and can be used to find out what's in a memory byte or to change the value held in that byte.

If you want to see what's in location &2000 you just use:

```
PRINT ?&2000
```

If you try this after running Program I, you'll find that you get 169, not A9 as you might expect. This is the *decimal* value held in location &2000.

The Electron will convert it to hexadecimal for you using the tilde, ~ as in:

```
PRINT ~169
```

Of course it's easier to use:

```
PRINT~?&2000
```

in the first place.

? can also be used to give an offset from a base address taking the form:

```
baseaddress?offset
```

which is handy for use in loops. Oddly, the base address has to be a variable holding the location value, it can't be the actual numeric address. Hence:

```
base=&2000
PRINT~base?2
```

gives the contents of memory location &2002 whereas:

```
PRINT &2000?2
```

just gives the decimal value of &2000 followed by the contents of memory location 2.

? can also be used to alter a location's contents. This takes the form:

```
?address=new_value
```

Since each location is a byte wide, it can only hold values between 0 and 255.

As an example, run Program I and alter location &2001 with:

```
?&2001=66
```

Check that you've got it right with:

```
PRINT ?&2001
```

and then:

```
CALL &2000
```

Can you explain what's happened to the code?

Programming

◀ *From Page 9*

why they can't use the following routine to get a new line :

```
.nwline
LDA #10 \code for CR
JSR oswrch
LDA #13 \code for LF
JSR oswrch
```

The trouble is that this is long-winded. What's really needed is osasci, which can be found at &FFE3. This routine does the same as oswrch and in addition, adds a line feed to any carriage return.

I leave it to you to knock up the required routine as an exercise. Otherwise stick to osnewl when you want a new line. Table I shows the routines and their addresses.

Routine	Address
Oswrch	&FFEE
Osrdch	&FFE0
Osnewl	&FFE7
Osasci	&FFE3

Table I: Some routine addresses

Our final program this month, Program V, shows how we can use assembly language to produce graphics. In effect we use the VDU codes

```
VDU 22,5
```

to select Mode 5 followed by:

```
VDU 25,6,255,0,255,0
```

to draw a line from 0,0 to 255,255.

This is done by successively loading the accumulator with the VDU code numbers and their parameters, passing the data over to the Electron's operating system using the versatile oswrch routine:

Try altering Program V, giving the parameters different values and see what happens.

● *That should keep you busy until next month, when we'll be learning about other registers and the mnemonics that go with them.*

```
10 REM Program V
20 codeStart=&2000
30 P%=codeStart
40 oswrch=&FFEE
50 [
60 .modeChange
70 LDA #22 \ select vdu
80 JSR oswrch \ tell the ope
rating system
90 LDA #5 \ select the mode
100 JSR oswrch \ inform the
os
110 .draw
120 LDA #25 \ vdu choice - P
LOT
130 JSR oswrch
140 LDA #6 \ pick DRAW optio
n
150 JSR oswrch
160 .coordinates
170 LDA #255 \ x coordinate,
 low byte
180 JSR oswrch
190 LDA #0 \ x coordinate, h
igh byte
200 JSR oswrch
210 LDA #255 \ y low
220 JSR oswrch
230 LDA #0 \ y high
240 JSR oswrch
250 RTS
260 ]
270 CALL codeStart
```

Before	Assembler	After
Mnemonics	become	Opcodes
Variables	become	Values
Functions	become	Values
Labels	become	Addresses

How the assembler interprets your program

The plume of my tante

OK – it's not perfect, but PIERRE DUPONT's DIY translator is a step in the right direction

FOREIGN languages are the bain of most peoples' lives. But now you can translate any word processed file from one language to any other, with the help of a pocket dictionary.

Text Translator – for disc users only – uses a simple, brute-force method for converting a file from one language to another.

It must first be fed some words, together with their best approximate translations, before you can set it to work.

It then scans through any named text file on disc, printing the translations of any words it recognises.

The only drawback is that you won't end up with a grammatical result. Things like past and present tenses will be ignored, and word order may be back to front – *la chaise verte* will end up as *the chair green* – but the program will still give you the gist of what the text is about.

To set up Text Translator, select option two from the main menu – Add to the dictionary. This is where you supply the words to the program's internal store.

Up to 150 words and their translations can be stored – a relatively small number, but surprisingly meaningful results can be obtained if the words are chosen with care.

You will be asked to enter a word, followed by the Return key. Next, type in the closest translation in the target language for that word.

Pocket dictionaries, like those in the Collins series, are perfect for this part of the proceedings.

When you think you have entered enough translations press Return in place of the next expected word, and you will be taken back to the main menu.

It would be wise to save the dictionary at this point, and option four will do this for you.

You will be prompted for a filename – any pathname may be entered if you have the ADFS – and warned if there is already a file of the same name present on disc.

Option three will load a previously created dictionary back from disc, wiping over any currently stored words.

Option five lists the current dictionary, pausing at the foot of every screenful until Shift is pressed, while option six will completely wipe the internal dictionary.

If you select this by mistake, either press the Escape key, or press the N key at the warning prompt.

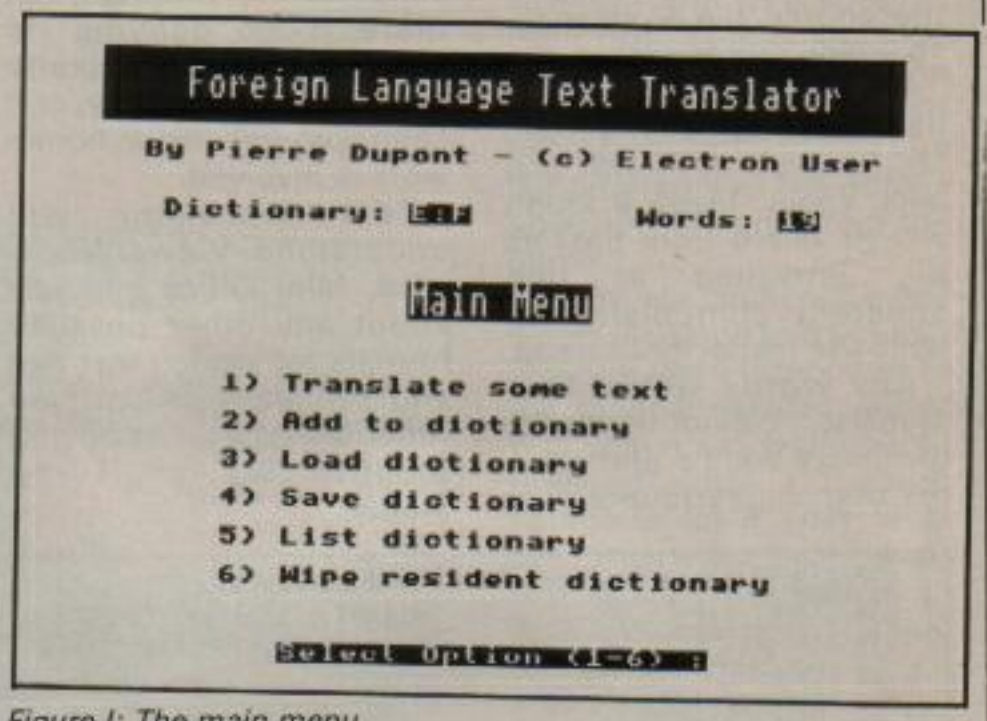


Figure I: The main menu

Now we finally move on to option one – Translate a text file. When you select this option, you will be asked for the name of the file in question, and the program will verify its existence for you.

Then you will be asked whether a hard copy – a printout – is required – to which you answer yes or no by pressing the Y or N keys.

Finally, Translator will ask you whether you would like the result of the translation spooled to disc.

This is a very valuable part of the program, because it enables you – after translation – to load in a dictionary which contains translations going the opposite way, and re-translate the spooled file back to its original state.

This way you can see quickly if the choice of

Turn to Page 12 ▶

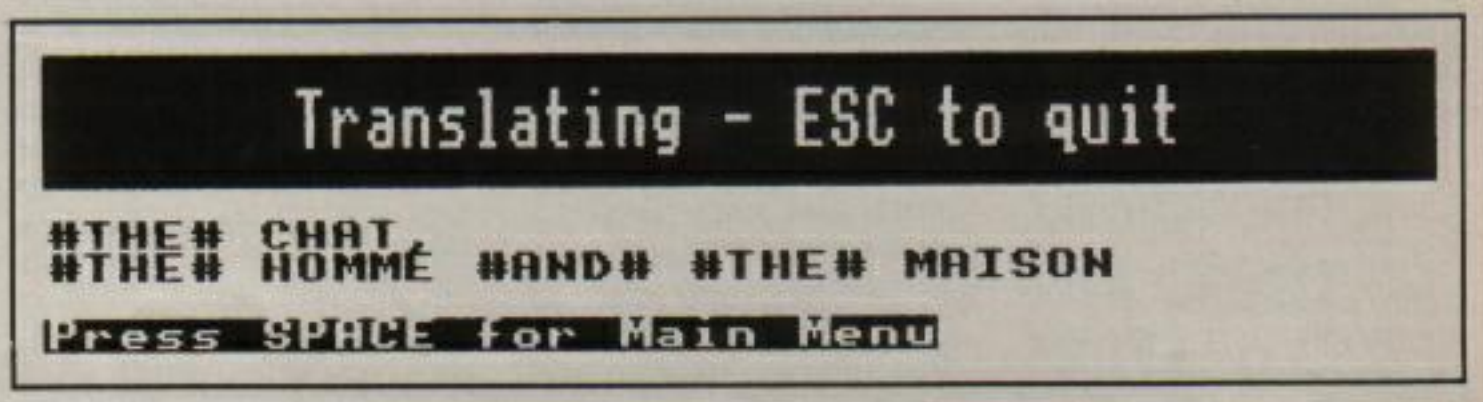


Figure II: The French translation of a short Wordwise file – but it's rather fractured!

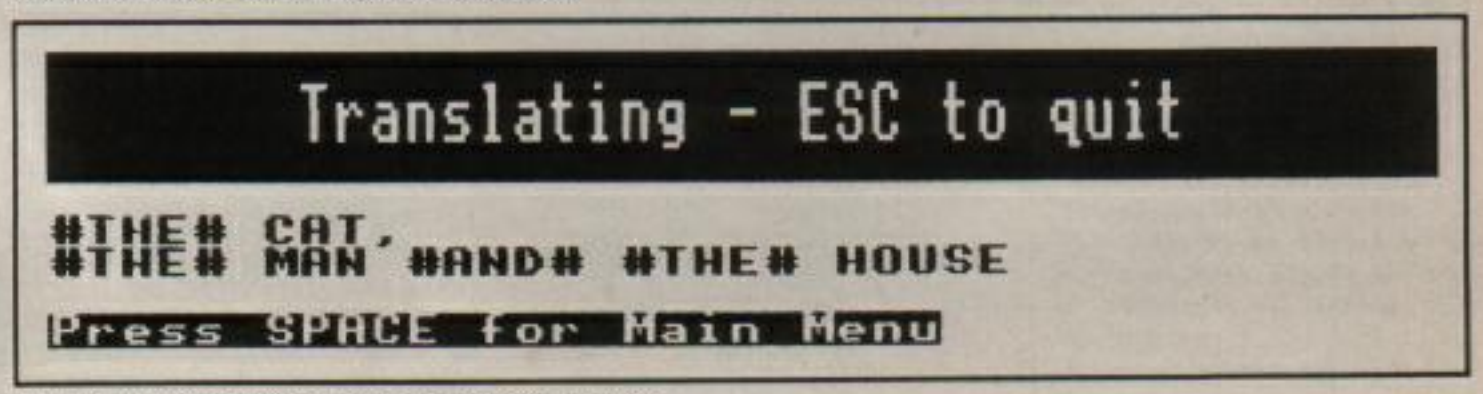


Figure III: The re-translation back into English tests the accuracy of your dictionary

◀ From Page 11

words in your dictionaries are the best. If the re-translation reads nothing like the original text, you have made some bad choices somewhere, because hopefully you should end up with a sort of a pidgin version of the source file – strange-sounding, but readable.

It can also be great fun translating something from, say, English to French and back again. Many a laugh will be heard from passers by, intrigued at this apparent compulsion to write like Inspector Cluseau.

Any words which Text Translator cannot find in its dictionary will be printed in the original, surrounded by a hash symbol on either side.

This way you can see just what the program is making of your precious text, while invariably producing something hilariously similar to Miles Kington's Franglaise column in Punch magazine.

Language teachers might cringe at this program, but there is no denying its usefulness – especially when going on holiday, or if Latin comprehension homework is involved.

Text Translator will understand View, Wordwise, Mini Office and just about any other possible formats for storing text that you can think of and will function quite happily in Slogger 64k or Turbo modes.

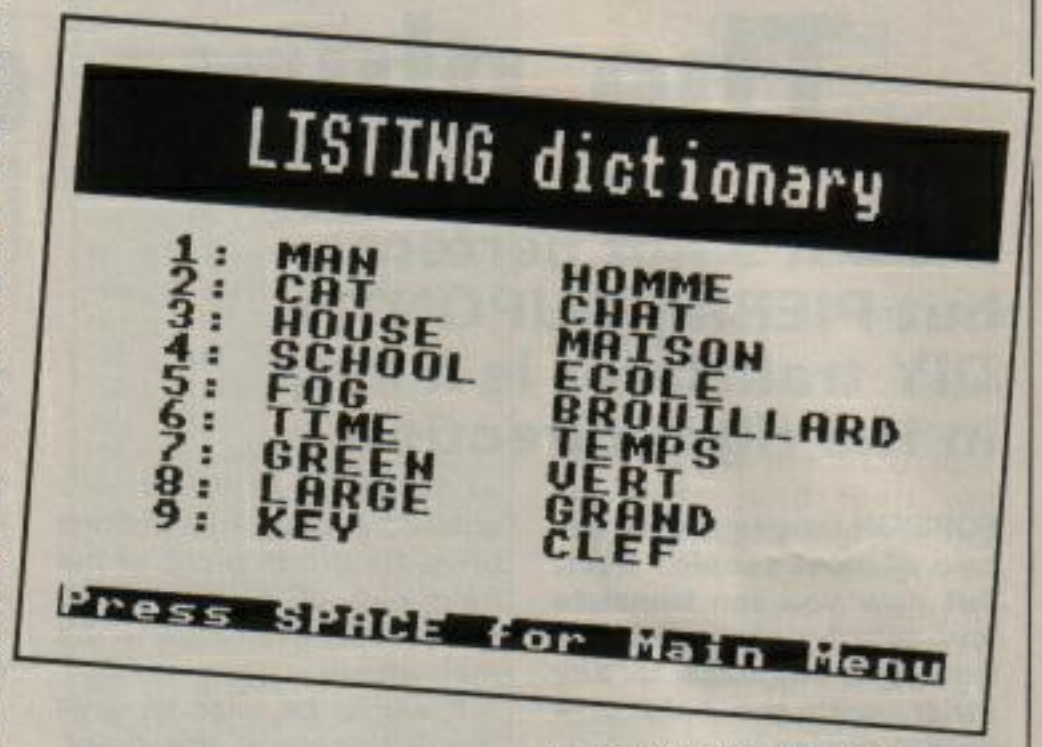


Figure IV: Listing the dictionary

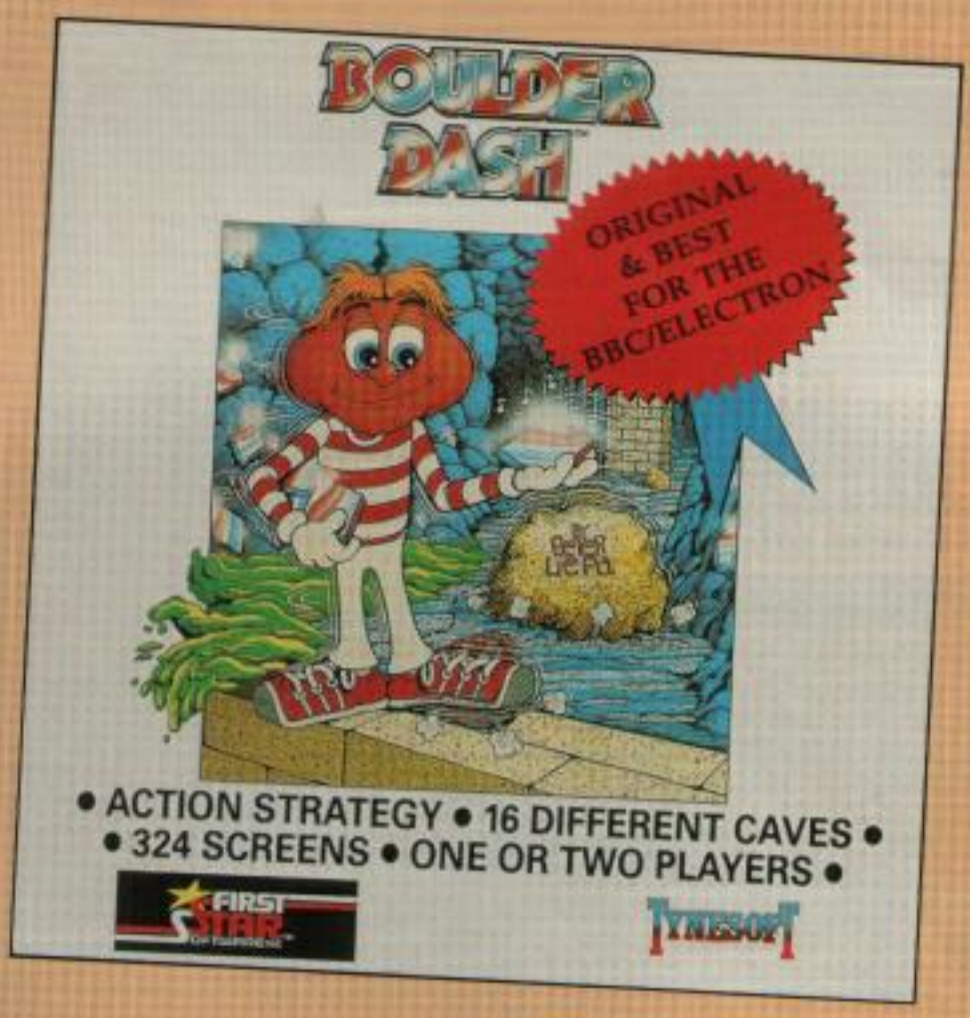
```
   10 REM Text Translator
   20 REM By Pierre Dupont
   30 REM (c) Electron User
   40 REM
   50 ONERRORGOTO620
   60 MODE4:PROCsetup
   70 CLOSE#0:PROCmenu:GOTO7
0
   80 DEFPROCsetup:DIMdic$(1
50,1)
   90 dic$="Unnamed":max%=0:
maxitem%=150:punc$=".,?!;:'
punc%=FALSE
  100 ENDPROC
  110 DEFPROCmenu:PROCtitle(
"Foreign Language Text Trans
lator"):PRINTTAB(2,5)"By Pie
rre Dupont (c) Electron User
":COLOUR0:COLOUR129:PRINTTAB
(15,12);:PROCbig("Main Menu"
):PRINT"":COLOUR1:COLOUR12
8
  120 PRINTSPC6"1) Translate
 some text"
  130 PRINTSPC6"2) Add to di
ctionary"
  140 PRINTSPC6"3) Load dict
ionary"
  150 PRINTSPC6"4) Save dict
ionary"
  160 PRINTSPC6"5) List dict
ionary"
  170 PRINTSPC6"6) Wipe resi
dent dictionary"
  180 PRINTTAB(3,8)"Dictiona
ry: ";:COLOUR0:COLOUR129:PRI
NTdic$:COLOUR1:COLOUR128:PRI
NTTAB(26,8)"Words: ";:COLOUR
0:COLOUR129:PRINT"";max%
  190 PRINTTAB(9,31)"Select
Option (1-6) :";:COLOUR1:COL
OUR128:REPEAT:G%=GET-48:UNTI
LG%>0 AND G%<7:ON G%GOTO200,2
10,220,230,240,250
  200 PROCtranslate:ENDPROC
  210 PROCadd:ENDPROC
  220 PROCload:ENDPROC
  230 PROCsave:ENDPROC
  240 PROClist:ENDPROC
  250 PROCwipe:ENDPROC
  260 STOP
  270 DEFPROCbig(B$):FORM%=1
TOLENB$:X%=0:Y%=&9:?&900=ASC
(MID$(B$,M%,1)):A%=10:CALL&F
FF1:L%=1
  280 FORX%=224TO225:VDU23,X
%:FORY%=0TO3:VDU?(&900+L%):V
DU?(&900+L%):L%=L%+1:NEXT:NE
XT:VDU224,8,10,225,11:NEXT:E
NDPROC
  290 DEFPROCtitle(B$):VDU28
,0,31,39,0:CLS:VDU23,1,0;0;0
;0;:COLOUR0:COLOUR129:FORY%=
0TO3:PRINTSTRING$(39," "):NE
XT:PRINTTAB(20-LENB$/2,1);:P
ROCbig(B$):COLOUR1:COLOUR128
:VDU23,1,1;0;0;0;:ENDPROC
  300 DEFPROCload:PROCtitle(
"LOAD dictionary"):INPUT""
""Filename ",dic$:in%=OPENIN
 dic$:IFin%=0 PROCtitle("No
such file - SPACE for Main M
enu:"):REPEAT:UNTILGET=32:EN
DPROC
  310 PROCtitle("LOADING "+d
ic$+" - Please wait"):max%=1
:REPEAT:INPUT#in%,dic$(max%,
0):INPUT#in%,dic$(max%,1):ma
x%=max%+1:UNTIL EOF#in%:CLOS
E#0:max%=max%-1:ENDPROC
  320 DEFPROCsave:IFmax%=0 E
NDPROC ELSE PROCtitle("SAVE
dictionary"):INPUT""""File
name ",dic$
  330 in%=OPENIN dic$:IFin%>
0 PROCtitle(dic$+" exists -
Replace (Y/N)?"):REPEAT:G%=G
ET AND 223:UNTIL G%=ASC"Y" O
R G%=ASC"N":IF G%=ASC"N" VDU
7:CLOSE#0:ENDPROC
  340 PROCtitle("SAVING "+di
c$+" - Please wait"):CLOSE#0
:out%=OPENOUT dic$:FORL%=1TO
max%:PRINT#out%,dic$(L%,0):P
RINT#out%,dic$(L%,1):NEXT:CL
OSE#0:ENDPROC
  350 DEFPROCwipe:IFmax%=0 E
NDPROC ELSE PROCtitle("WIPE
dictionary (Y/N)?"):REPEAT:G
%=GET AND 223:UNTILCHR$G%="Y
" OR CHR$G%="N":IF CHR$G%="N
" VDU7:ENDPROC
  360 dic$="Unnamed":max%=0:
ENDPROC
  370 DEFPROCadd:IFmax%=maxi
tem% VDU7:ENDPROC ELSE PROCt
itle("ADD to the dictionary"
):VDU28,0,31,39,5
  380 REPEAT:max%=max%+1:PRI
NT"Word ";max%;" (or RETURN
to quit) ";:INPUTW$:IFW$=""
max%=max%-1:UNTILW$="":ENDPR
OC
  390 dic$(max%,0)=W$:INPUT"
Translation",T$:dic$(max%,1)
=T$:PRINT:UNTILmax%=maxitem%
  400 DEFPROCtranslate:IFmax
%=0 VDU7:ENDPROC ELSE PROCti
tle("TRANSLATE text")
  410 INPUT""""Filename ",F
$:in%=OPENIN F$:IF in%=0 PRO
Ctitle("No such file - SPACE
 for Main Menu:"):REPEAT:UNT
ILGET=32:ENDPROC
  420 PROCtitle("Hard copy (
Y/N)?"):REPEAT:G%=GETAND223:
UNTILG%=ASC"Y" OR G%=ASC"N":
IF G%=ASC"Y" print%=TRUE ELS
E print%=FALSE
  430 PROCtitle("Spool outpu
t (Y/N)?"):REPEAT:G%=GETAND2
23:UNTILG%=ASC"Y" OR G%=ASC"
N":IF G%=ASC"Y" spool%=TRUE:
INPUT""""Filename for spool
ing ",sp$ ELSE spool%=FALSE
  440 PROCtitle("Translating
 - ESC to quit"):IFspool% TH
EN $&900="SPOOL "+sp$:X%=0:Y
%=9:CALL&FFF7
  450 VDU28,0,31,39,5:CLS:IF
 print% VDU2
  460 REPEAT:eof%=FNfetch:PR
OCmatch:PROCoutput:UNTILeof%
:VDU3:CLOSE#0:IF spool% THEN
 *SPOOL
  470 COLOUR0:COLOUR129:PRIN
T""Press SPACE for Main Men
u";:COLOUR1:COLOUR128:REPEAT
:UNTIL GET=32:ENDPROC
  480 DEFFNfetch:REPEAT:B%=B
GET#in%:C%=INSTR(punc$,CHR$B
%):IFC%>0 UNTILC%>0:W$=MID$(
punc$,C%,1):=FALSE
  490 UNTIL(B%>64 AND B%<91)
 OR (B%>96 AND B%<123) OR EO
F#in%:IF EOF#in% THEN =TRUE
  500 B%=B%AND223:W$=CHR$B%:
REPEAT:B%=BGET#in%:IF EOF#in
% THEN 530
  510 C%=INSTR(punc$,CHR$B%)
:IFC%>0 P$=MID$(punc$,C%,1):
punc%=TRUE ELSE punc%=FALSE
  520 IF (B%>64 AND B%<91) O
R (B%>96 AND B%<123) W$=W$+C
HR$(B%AND223)
  530 UNTIL (B%AND223)<65 OR
 (B%AND223)>90 OR EOF#in%:IF
 EOF#in% THEN =TRUE
  540 =FALSE
  550 DEFPROCmatch:C%=INSTR(
punc$,W$):IF C%>0 M$=W$:ENDP
ROC ELSE F%=0:FORL%=1TOmax%:
IF F%=0 THENIF W$=dic$(L%,0)
 F%=1:M$=dic$(L%,1)
  560 NEXT:IF F%=0 M$="#"+W$
+"#"
  570 ENDPROC
  580 DEFPROCoutput:PRINTM$;
:IF punc% PRINTP$:ENDPROC EL
SE IFeof% ENDPROC
  590 PRINT" ";:ENDPROC
  600 DEFPROClist:IFmax%=0 V
DU7:ENDPROC ELSE PROCtitle("
LISTING dictionary"):VDU28,0
,31,39,5,14
  610 FORL%=1TOmax%:PRINTL%;
": ";dic$(L%,0),dic$(L%,1):N
EXT:PRINT':COLOUR0:COLOUR129
:PRINT"Press SPACE for Main
Menu";:COLOUR1:COLOUR128:REP
EAT:UNTILGET=32:ENDPROC
  620 IF ERR=17 GOTO 70
  630 PROCtitle("ERROR - pre
ss SPACE for Main Menu"):PRI
NT"":REPORT
  640 REPEAT:UNTILGET=32:GOT
070
```

This listing is included in this month's cassette tape offer. See order form on Page 53.

Rocky original

GOLDEN electron user GAME

Product: Boulderdash
Price: £9.95
Supplier: Tynesoft, Unit 3, Addison Industrial Estate, Blaydon, Tyne & Wear NE21 4TE.
Tel: 091-414 4611



BEFORE you say wearily, "Oh no, not another Repton-type game", let me put the record straight. Boulderdash has the enviable reputation of being the game which inspired Repton and all its clones all those years ago.

So why is it finally being released for the Electron/BBC Micro market, which by now must surely be saturated to bursting point with diamond-digging maze games? The answer is, as ever, that the original is usually the best. Not always, but in this case it is certainly true.

I, like many others, cracked my maze-digging teeth on Repton long before I ever heard of Boulderdash. I first played Boulderdash on an Amstrad CPC464 about a year ago, and thought to myself that Repton had better watch out.

Little did I know that this newcomer actually predated my favourite by quite a stretch, albeit on a different machine – the old 8 bit Atari.

Well, here it is at last on the Electron, and jolly good it is too. You play the part of Rockford, a cute little character who is a right little hoarder, and addicted to those big glistening diamonds scattered about the place just waiting to be scooped up.

Unfortunately, opposition to Rockford's greed lies in the form of hundreds of lethal boulders, deadly butterflies and a rapidly-growing, pulsating amoeba.

You won't meet the amoeba until the later levels – there are 16 in all – but the other hazards are present right from the start.

Most obviously dangerous are the boulders. Although this doesn't need explaining to Repton fans, the boulders are imbedded in earth and digging for diamonds undermines their support. If a boulder falls on Rockford, it's curtains.

A large element of strategy is involved in turning things to your advantage. Boulders may be pushed either left or right, and as they will topple off the edge of a precipice – which can be dug carefully to suit your requirements – traps can be laid for the mutant butterflies.

Dropping a boulder on a butterfly mutates it into nine separate diamonds. As a set quota has to be collected, butterfly crushing is a necessary pastime – especially on levels deliberately low in their supplies of diamonds.

Collecting the full quota for a given screen causes a door somewhere in the maze to be activated. It won't always be near you, so when you hear the bang which signifies its opening, a quick dash is indicated, especially if time is running short – there is a time limit for each level.

The green amoeba encountered on later levels is a real pain. It grows at a phenomenal rate and after a certain point it will turn into hundreds of boulders, which will then rain destruction on Rockford's head. Another incentive to hurry things up.

What surprised me the most about Boulderdash was the way the screens have been copied faithfully from the original version on the 8 bit Atari. The two micros are worlds apart and the programmer has done a good job in converting the game.

As far as I could tell, every single diamond and boulder is in the same location as in the original version, and it was with great excitement I realised that I could complete level after level using exactly the same techniques that I had spent so long working out a year ago on the Amstrad.

That is the mark of a truly successful game conversion. Even the sprites are identical, except that the Electron/BBC Micro version runs in Mode 5, using just four colours – but then so does Repton.

My only niggle, oddly enough, was in the keyboard control. Rockford simply would not stop smartly on the spot when I released the keys.

Instead – during what were usually tightly calculated manoeuvres – he would plough ahead for one more move, totally mucking up the strategy and sometimes getting himself crushed under a deadly impromptu rockfall.

My verdict is that Boulderdash is the original diamond digging game and it's still the best ever. Buy it, even if you are an unshakeable Repton fan – you'll be amazed at just how addictive it can be.

There are many, many more secrets further into the game which I'm not going to spoil by revealing here.

Chris Nixon

Sound	7
Graphics	8
Playability	9
Value for money	10
Overall	9

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NEW PRODUCT

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7. *LROMS – to lock all sideways RAM banks found.
8. *UNLOCK – to unlock a sideways RAM bank in ABR, AQR, AP7.
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13. *VERIFY – reads and tests every sector on an ADFS disc.
14. *VFORM – formats and verifies an ADFS disc in one command.
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16. *LIST – displays a numbered listing of a text file.
17. *TYPE – displays a file on screen with no line numbers.
18. *DUMP – to view a file's contents on screen.
19. *LANG – selects a default language to be booted on <CTRL-BREAK>
20. *HELP – provides a full 'help' list on all the ROM's commands
    STOP PRESS
21. *AQRPAGE – selects the specified page in any AQR present.

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Suitable for existing Plus 3 or A.P.4 users. This new version has the software fixes for Zysyshelp, write protect disable & compaction. Also Winchester code has been replaced with the necessary driving software to handle AQR as a 256k RAM DISC. Please note – ADFS is Acorns adopted standard filing system supplied on the Plus 3, Master 128, Master Compact & now the Archimedes. Supplied on 16k ROM with Welcome disc, utilities & full documentation.

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ADFS E00
For ELectron users with either Plus 3 or A.P.4 and 32k of S/W RAM i.e. ABR. All the benefits of ADFS but without all the loss of RAM! Includes all the software 'fixes' as in version 1.1 as well as the AQR/RAM DISC code and an 'FX' call for managing the new & original ADFS. One of the most frequent questions we are asked: "How do I get back the memory lost on my Plus 3 system?" Answer: PRES ADFS &E00 regains 3.75k leaving page @ &E00 the same as Tape! Supplied on 3.5" disc.

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Phantom of the skies

Product: Phantom Combat
Price: £9.95
Supplier: Doctor Soft, P.O. Box 66, East Preston, West Sussex BN16 2TX.

THIS is the single computer version of a program demonstrated on BBC Television's Micro Live. You may have heard of Doctor Soft's now famous Double-Phantom flight simulator, where two BBC Micros are linked together via their RS423 ports.

Each computer controls a separate jet, but both occupy the same air space and each is visible out of the cockpit window to the other player.

Phantom Combat is the single player version of the same game – or should I say, single computer version, because Phantom Combat does support a kind of two-player option.

The instrument panel at the bottom of the screen is superbly drawn in full colour with analogue dials and digital readouts. I have never seen as good an instrument display on the Electron. There is also a black and white version of Phantom Combat further on the tape, in Mode 4 for extra speed.

Flying is easier said than done. Although the manual lists all the keys, I kept fumbling because of the illogical and confusing choice for pitch and roll. However, all the other keys were sensible enough.

The handling characteristics of the Phantom feel good and Mach II flight can be achieved very quickly. When in combat mode, your adversary appears as a delta-wing shape.

The enemy planes are based on two real life jets – the Soviet Mig 21 and Su 15 – and supposedly mimic their big brothers' accurately. I couldn't really tell, but they are certainly deadly enough and quite intelligent.

The cassette inlay takes great pains to stress the fact that this is a proper simulator and doesn't rely on arcade sprites to depict the objects. Everything, we are assured, is calculated and drawn on the screen at the rate of 15 frames a second.

I must agree that I wouldn't consider a game to be a true simulator either if the landscape and objects were drawn as sprites. But no flight simulator does this, so I can't see why Doctor Soft makes such a big thing of it.

And I must take issue with the claim of 15 frames a second animation. The flicker is dreadful. The techniques rather than the Electron's slow speed are at fault here – the display is constantly being drawn and wiped again, resulting in it being blank for 50 per cent of the time.

Phantom Combat is a

good simulator, marred only by a flickering screen display and a brief manual. This is a program which probably only comes into its own as the dual computer BBC Micro version, but as a stand-alone Electron simulator it is a good buy.

Chris Nixon

Sound	2
Graphics	8
Playability	6
Value for money	7
Overall	6

Battling buzzards

Product: Skirmish
Price: £9.95
Supplier: Godax, 12 Chiltern Enterprise Centre, Theale, Berkshire RG7 4AA.
Tel: 0734 302600

IMAGINE a world in which you sit astride a giant ostrich and engage in medieval-style jousting contests with opponents riding giant buzzards. This is the setting for Joust, Atari's smash arcade hit.

It sets itself apart from most other games by taking the idea of a two player game one stage further – you play not only against another human player, but also against a number of other computer opponents. Thus half a dozen combatants can be on the screen at once.

Now we have Skirmish, a superb conversion of this arcade favourite. Once loaded, three landing stages are displayed and you are invited to start the game.

I found that the player sprites look rather messy because of the crammed-in detail. Aside from this minor point, Skirmish faithfully recreates all the addictive qualities of the original.

The controls are simple: Left, right and flap. The last control causes your bird to flap its wings once. Press it repeatedly to hover and faster still to gain height.

Skirmish features three different types of computer controlled rider – the bounders, wearing armour, are fairly easy to defeat, the Hunters are more cunning and the Shadow Lords are almost impossible to dismount.

To win a joust you must fly into an opposing player making sure your lance is higher than his. A vanquished human opponent loses a life and reappears somewhere else on the screen.

However, a computer opponent falls off his mount and turns into an egg, while his riderless buzzard flies off into the distance. You must grab the egg quickly or it will hatch, spawning a rider of the next grade.

If your lance is lower than your opponent's, you will die and your bird will fly mournfully away. You soon learn to fly to the top of the screen as quickly as possible, but even this commanding position is by no means safe.

When all the computer controlled riders have been defeated the next wave begins. Later stages add even more nasties: The lava troll that stalks along the bottom of the screen ready to grab any foolhardy contestant who comes too close. And the indestructible pterodactyl that flies backwards and forwards until the wave has ended. The pterodactyl can appear on earlier waves if you take too long to dispose of your opponents – give it lots of air space.

Skirmish provides all the useful features that make all the difference to any good game: Pause/restart, sound on/off and quit game are all included. I can recommend it wholeheartedly – and it's even better if you have a Slogger Turbo board fitted.

It is one of the most playable games I have seen this year and will certainly lead to many late nights. To quote the loading commentary: Prepare to joust, buzzard bait.

Martin Reed

Sound	7
Graphics	7
Playability	9
Value for money	8
Overall	8

Quality compendium

Product: Play it again Sam 2
Price: £9.95
Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX.
Tel: 0532-459453

THIS is Superior's follow-on to Play it again Sam, and once more we have four classic hits packaged together for the price of one. First on the twin-cassette pack is **Repton 3**, the sequel of the sequel of the original smash hit Repton, which helped to make Superior what it is today.

Repton is a great game and probably needs little introduction to Electron owners other than to say that it is based on the original diamond digging arcade adventure game Boulderdash – also reviewed this month.

Repton 3 features the now famous little character who loves digging for diamonds. The object is to defuse a time bomb present in each of the 24 screens, but first every diamond in the screen has to be collected, as well as a fabulous golden crown.

The puzzles are many and varied, and there is also a deadly fungus to avoid. This grows and grows until you are eventually swallowed up and the only way to halt its progress is to surround it with rocks.

Repton 3

On the flip side of cassette one is **Codename: Droid** – **Stryker's run part 2** – there's a map to this in this month's Arcade Corner. Stryker's Run was one of my favourite games, but until now I hadn't played its sequel – and I was impressed with what I saw.

For a start, Commander Stryker's animated figure moves even more realistically, if that is possible, and he can even crawl on his belly to negotiate low objects.

The plot behind Codename: Droid is, yet again, to foil the evil Volgans in their plot for world supremacy. This time your mission is to secretly land on the planet Volga and steal their revolutionary new spacecraft – Codename Z11 – from under their green noses.

To aid you, jet packs are to be found in various places to enable you to fly over obstacles and chasms. You also have a very sophisticated wrist terminal from which you can obtain lots of information about your current whereabouts.

To reach the enemy spacecraft, 12 levels of the complex must be descended. There are lifts, but you must first collect a security pass – which is only valid for transport either down or up one level.

Volgan guards abound and will shoot as soon as you approach them. To keep you on your toes, the further into the complex you descend the tougher their armour becomes, requiring more blasts from your laser to turn them into nicely animated skeletons.

This game is much more complex than its predecessor and so much is involved that I can do no more than recommend you buy this compilation and find out more.

The second cassette is devoted to games by Kevin Edwards, who first hit the charts with his excellent **Galaforce**, nearly two years ago (doesn't time fly?), and it is now doing the rounds again on this compilation.

If you didn't buy Galaforce the first time round, you must not miss this opportunity to play what is, in my opinion, the best shoot-'em-up ever for the Electron and BBC Micro.

This praise is unqualified by any niggling moans. The game is sheer excellent programming, totally addictive and graphically stunning – you'll never see sprites this big move so fast on your Electron again.

Wave after wave of different aliens sweep down upon you in set patterns and the art of playing Galaforce is to memorise as many alien formation types as possible – if you don't, you won't last more than a few seconds in each zone.


Galaforce

I noticed that even the soundtrack has been faithfully copied from the BBC Micro version. Even though the Electron can't support more than one channel sound, the three-

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part harmony has been broken down, each part played in succession so you don't miss out on the full effect.

What surprised me was the scrolling star backdrop. I had assumed that its inclusion in the Electron version would slow things down. Nothing could be further from the truth.

The action, while not quite as blindingly fast as on the BBC Micro, still comes thick and furious. I think the compilation is worth the cash for this game alone.

Moving on to the final offering on the reverse of cassette two, **Crazee Rider**, I was slightly disappointed. This is Kevin Edwards' second game for Superior, but it is – pardon the pun – streets behind Galaforce.

Faced with a motorcycle racing game, I was all settled in for an exciting session. The credits looked promising, fading in and out nicely and with mounting anticipation I pressed Space to start the race.

It says in the instructions that you can knock other riders off the track, and that this is especially effective during the crazy scramble at the start of each race.

Well, try as I may I could only hit one or two other bikes, because my acceleration was so lousy compared to everyone else's that I couldn't match speeds with any other riders until the race was well under way.

I dare say that devotees of this game will just say hard cheddar for being a useless player, but as someone who could consistently win the race in Revs on the BBC Micro with a lap time in the top three best, I couldn't help but feel that there was something missing with Crazee Rider.

Perhaps it isn't fair to compare a full racing simulation like Revs with what is obviously a knock-'em-off fun game, but it really lacked that satisfying feeling – for me, at any rate.

Chris Nixon

Sound	7
Graphics	8
Playability	9
Value for money	10
Overall	9

Spring into adventure

Product: Quest
Price: £9.95
Supplier: Superior Software, Regent House, Skinner Lane, Leeds LS7 1AX.
Tel: 0532-459453

RELEASES from Superior's stable are always to be taken seriously, and the latest game, Quest, is no exception. It is an arcade adventure – always one of Superior's favourite themes – in which you play the part of Walter Cobra, a clever but absent-minded young chap who has two favourite hobbies – exploring and inventing.

One day you stumble across a faded old map which shows the route to a buried object marked as the Golden Dragon. The starting point is a wishing well

located a couple of miles from your home.

The next day you amble over to the well and climb down it. Only after reaching the bottom of the well do you remember the map, which is still at home. However, having come this far you decide to press on regardless, and so – according to the cassette inlay – begins the greatest adventure of your life.

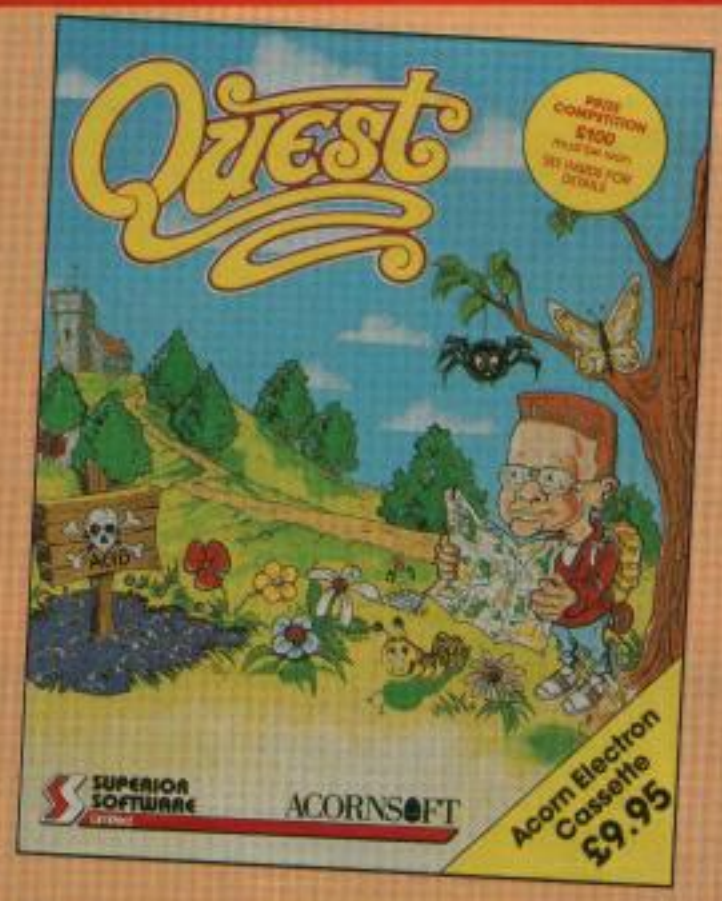
The objective is to seek and retrieve the legendary Golden Dragon shown on the original map. In the process, 12 power crystals must be collected and you must destroy three reactors. Destroying a reactor is achieved by getting inside it and firing a stun grenade – one of Walter's little inventions.

You control Walter with three keys: Left, right and jump. He is equipped with another of his little inventions – a pair of jet boots which will only function in rooms containing large triangular objects called transmogrifiers.

A great deal of the game's strategy derives from how you use these boots. Some rooms are so lethal it is safer if you fly through them. But no transmogrifier means you have to build up enough momentum from a neighbouring location to literally coast across in free fall.

Scattered throughout the maze are eight computer terminals, which can be interrogated if you are carrying the right object and know the password.

I played this game for a long while without ever encountering a terminal, let alone a crystal. This goes to show just how large the adventure is, and it should certainly keep the old grey matter buzzing for a long time.



Quest lacks the clean-cut feel present in some of Superior's other games. While remaining an extremely challenging and very stimulating arcade adventure, little things niggled me. The screens are very cluttered and sometimes it's not too clear just what is going on.

Some floors can look solid, but you will fall through them because the screen seems to contain some actual program data, which lies across the bottom of the picture.

Summing up, Quest is a nice arcade adventure, following in the footsteps of Citadel and Palace of Magic. The addition of gimmicks like the jet boots and computer terminals keep the interest up and I can certainly recommend it for its addictiveness alone.

Barry Wood

Sound	5
Graphics	8
Playability	9
Value for money	9
Overall	8

Tackle typing terrors!

Improve your key bashing skills with ROLAND WADDILOVE's devious typing tutor

THIS fast and furious arcade shoot-'em-up is actually a typing tutor, and is designed to improve your hand-eye coordination and knowledge of the keyboard.

Unlike other tutors, this one is intended to be both fun and addictive, while teaching you important skills at the same time.

The game places you at the controls of a strategic defence missile silo and it is your task to save the Earth from hordes of marauding alien invaders.

These bug-eyed monsters appear out of hyper space and drop down through the upper stratosphere toward the ground. Little do they know what is in store for them!

Underground are many missile silos, built for just such an invasion. Each has its own control button and pressing it sends a missile to meet the oncoming extra-terrestrials.

The keys to press are printed at the bottom of the screen and change with every wave of invaders.

The first fleet of aliens descend slowly, but later ones move more quickly. You shouldn't experience any problems dispatching the first lot, but the others may prove a litle more difficult – it all depends on how fast you can hit the appropriate letters.

If any aliens land they explode leaving a large crater and the blast will reduce your energy – indicated by a horizontal energy meter just above the control keys.

There is a great temptation to cheat and simply hit every key on the keyboard as fast as you can. To prevent this, your energy is reduced slightly every time you hit a wrong key, so accuracy is just as important as speed.

The whole game – apart from the instruction screen – is written in assembly language for speed.

Be careful when entering the listing as a single typing error could make the Electron hang up, or at least print an obscure and meaningless error message.

To be on the safe side, save the program before running it.

```
  10 REM Typing Terrors
  20 REM By R.A.Waddilove
  30 REM (c) Electron User
  40 MODE 4:*FX16
  50 PROCassemble
  60 PROCinstructions
  70 W%=0:?landed=37
  80 REPEAT
  90 PROCscreen
 100 CALL code
 110 UNTIL ?landed=0
 120 VDU28,2,15,17,10,12:CO
LOUR 3
 130 PRINTTAB(1,1)"You're d
ead!"TAB(2,3)"Another game?"
 140 FOR i=0 TO 2000:NEXT:*
FX21
 150 IF INSTR("Yy",GET$) RU
N
 160 MODE 6
 170 END
 180
 190 DEF PROCinstructions
 200 VDU23,254,170,85,170,8
5,170,85,170,85
 210 OSCLI"FX211":*FX4,1
 220 PROCbig("Typing Terror
s",350,1000)
 230 PRINT TAB(0,5)"Alien i
nvaders are attacking the Ea
rth"
 240 PRINT:PRINT"once more.
 Your task is to save the"
 250 PRINT:PRINT"planet fro
m destruction. You have 10"
 260 PRINT:PRINT"missile ba
ses each controlled by a"
 270 PRINT:PRINT"separate k
ey - printed at the bottom"
 280 PRINT:PRINT"of the scr
een. Press a key to fire a"
 290 PRINT:PRINT"missile."
 300 PRINT TAB(0,20)"Press
SPACE to start...";
 310 REPEAT UNTIL GET
 320 VDU22,5,23,1;0;0;0;0;
 330 ENDPROC
 340
 350 DEF PROCscreen
 360 COLOUR 129:CLS
 370 COLOUR 2:PRINTTAB(3,10
)"Get Ready...";TAB(4,12)"Fo
r Wave ";W%;"..."
 380 COLOUR 129:VDU28,0,31,
19,26,12,26:PRINT TAB(0,26)S
TRING$(40,CHR$254)
 390 GCOL0,0:MOVE 16,116:DR
AW 16,40:DRAW 1264,40:DRAW 1
264,116:DRAW 16,116
 400 MOVE 32,148:DRAW 1250,
148:MOVE 32,144:DRAW 1250,14
4
 410 FOR I%=1 TO ?landed+1
 420 ?(&79C2+I%*8)=&0F:?(&7
9C3+I%*8)=&0F
 430 NEXT
 440 GCOL0,3:MOVE 24,152:DR
AW 1256,152:DRAW 1256,140:DR
AW 24,140:DRAW 24,152
 450 W%=W%+1:k$=""
 460 PRINT TAB(1,31)"Wave:"
;W%;TAB(9,31)"Score:0000";
 470 FOR i=0 TO 9
 480 REPEAT a$=CHR$(64+RND(
26)):UNTIL INSTR(k$,a$)=0:k$
=k$+a$
 490 i?keys=ASC(a$)
 500 PROCbig(a$,32+i*128,10
6)
 510 NEXT
 520 IF W%<4 ?speed=4-W% EL
SE ?speed=0
 530 COLOUR 128
 540 PRINTTAB(0,10)STRING$(
60," ")
 550 COLOUR 129
 560 ENDPROC
 570
 580 DEF PROCbig(a$,X%,Y%)
 590 VDU5:MOVEX%,Y%
 600 FOR I%=1 TO LENa$
 610 A%=&C000+(ASC(MID$(a$,
I%))-32)*8
 620 VDU23,255,?A%,?A%,A%?1
,A%?1,A%?2,A%?2,A%?3,A%?3
 630 VDU255,10,8
 640 VDU23,255,A%?4,A%?4,A%
?5,A%?5,A%?6,A%?6,A%?7,A%?7
 650 VDU255,11
```

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ICARUS

£9.95 cassette
BBC Model B, B+, Master and Electron

£11.95 disc
BBC series: 5¼" or 3½"

Split-screen action with different views for each player. When you are both in the same area the views are the same.

Crack the code to the forcefield, pass through the portals to raid the area of valuable credits, then head for the lift.

Now TWO can play – and experience . . .

THE CHALLENGE OF A LIFETIME!

Starship Icarus is plummeting towards the sun, and the only hope of averting the impending cataclysm is for you to teleport on board, disable the master computer and regain control . . .

This spectacular fast-action game has a unique split-screen which means that one player can complete the game on his own – or play simultaneously with a friend – to fight the trigger-happy droids which infest the ship. With 20 levels of nerve-racking excitement, forcefields, mines, electronic doors, emergency lifts, movable walls, and opportunities to build up your armour, blaster and health ratings, this is one game you won't complete in a few weeks!

There can be no doubt that Icarus, with its incredible one- or two-player action, is one of the most exciting games ever created for the BBC Micro and Electron.

Check it out for yourself – and take up the challenge!

MANDARIN SOFTWARE

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Adlington, Macclesfield SK10 4NP.

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Icarus is the result of six months' intensive work by Powerhouse Software, the programming team which developed the top-selling Dunjunz. A full three months has been spent play-testing and fine-tuning to produce an addictive challenge with a gameplay that's really out of this world!

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```
  660 NEXT
  670 VDU4
  680 ENDPROC
  690
  700 DEF PROCassemble
  710 DIM code 1200
  720 osbyte=!&20A:oswrch=!&
20E
  730 dim=8
  740 new=&50:temp=&52
  750 columns=&54:rows=&55
  760 temprows=&56:speed=&57
  770 acount=&58:lcount=&59
  780 inkey=&5A:wave=&5B
  790 delay=&5D:landed=&5E
  800 keys=&90
  810 FOR pass=0 TO 2 STEP 2
  820 P%=code
  830 [OPT pass
  840
  850 .start
  860 LDA #0:STA wave:LDA #5
:STA wave+1
  870 LDY #9:STY lcount  \10
 aliens
  880 LDA #9*dim:STA acount
  890 .loop
  900 JSR &AF51:LDA &2A:ORA
#1
  910 LDX acount
  920 STA aliens+2,X:STA ali
ens+4,X
  930 LDY lcount:LDA keys,Y:
STA aliens+7,X
  940 TYA:ASL A:ASL A:STA al
iens,X
  950 LDA #0:STA aliens+3,X
  960 STA aliens+6,X  \no mi
ssile
  970 SEC:LDA acount:SBC #di
m:STA acount
  980 DEC lcount:BPL loop
  990
 1000 .main
 1010 JSR delay_loop
 1020 LDA #9*dim:STA acount
 1030 JSR input
 1040 LDA landed:BEQ exit
 1050 .loop
 1060 SEI:JSR move_aliens:CL
I
 1070 LDA landed:BEQ exit
 1080 JSR fire
 1090 LDA #&81:LDY #&FF:LDX
#&8F:JSR osbyte
 1100 TYA:BNE exit
 1110 SEC:LDA acount:SBC #di
m:STA acount
 1120 BPL loop
 1130 DEC wave:BNE main
 1140 DEC wave+1:BNE main
 1150 .exit
 1160 RTS
 1170
 1180 .input
 1190 LDA #&81:LDX #0:LDY #0
:JSR osbyte
 1200 TYA:BEQ keyp
 1210 LDX #0:JMP end_input
 1220 .keyp
 1230 TXA
 1240 LDY #9
 1250 .loop
 1260 CMP keys,Y:BEQ end_inp
ut
 1270 DEY:BPL loop
 1280 JSR power
 1290 .end_input
 1300 STX inkey
 1310 RTS
 1320
 1330 .power
 1340 STY temp:STX temp+1
 1350 LDA #7:JSR oswrch
 1360 LDX landed:INX:LDY #21
8:JSR convert
 1370 LDA #0:TAY:STA (new),Y
:INY:STA (new),Y
 1380 DEC landed
 1390 LDX temp+1:LDY temp
 1400 RTS
 1410 .score
 1420 LDA #7:JSR oswrch
 1430 LDA #31:JSR oswrch:LDA
 #15:JSR oswrch:LDA #31:JSR
oswrch
 1440 LDX #2
 1450 .loop
 1460 INC digits,X
 1470 LDA digits,X:CMP #ASC"
0"+10:BNE sc_ok
 1480 LDA #48:STA digits,X
 1490 DEX:BPL loop
 1500 .sc_ok
 1510 LDX #0
 1520 .loop
 1530 LDA digits,X:JSR oswrc
h
 1540 INX:CPX #3:BNE loop
 1550 LDX acount
 1560 RTS
 1570 .digits EQUS "0000"
 1580 .delay_loop
 1590 LDA speed:BEQ del_end:
STA delay
 1600 .loop
 1610 LDA #19:JSR osbyte
 1620 DEC delay:BPL loop
 1630 .del_end RTS
 1640
 1650 .fire
 1660 LDX acount
 1670 LDA aliens+6,X:BEQ new
_miss
 1680 LDA aliens+2,X:BNE mov
e_miss
 1690 SEC:LDA aliens+5,X:SBC
 aliens+1,X:CMP #20:BCS move
_miss
 1700 LDA #2:STA aliens+3,X
 1710 JSR score
 1720 .miss_off
 1730 LDY aliens+5,X:LDA ali
ens+6,X:TAX:JSR convert
 1740 LDA #0:LDX acount:STA
aliens+6,X
 1750 LDA #blank MOD256:STA
pdata+1:LDA #blank DIV256:ST
A pdata+2
 1760 LDX #1:LDY #12:JMP pri
nt
 1770 .move_miss
 1780 LDA aliens+5,X:BEQ mis
s_off:SEC:SBC #4:.mm STA ali
ens+5,X
 1790 TAY:LDA aliens+6,X:TAX
:JSR convert
 1800 LDA #missdata MOD256:S
TA pdata+1:LDA #missdata DIV
256:STA pdata+2
 1810 LDX #1:LDY #12:JMP pri
nt
 1820 .new_miss
 1830 LDA aliens+7,X:CMP ink
ey:BEQ put_miss:RTS
 1840 .put_miss
 1850 CLC:LDA aliens,X:ADC #
1:STA aliens+6,X:LDA #196:JM
P mm
 1860
 1870 .move_aliens
 1880 LDX acount
 1890 LDA aliens+2,X:BNE new
_alien
 1900 LDA aliens+3,X:BEQ ali
en_ok
 1910 DEC aliens+3,X:BEQ era
se
 1920 \start exploding
 1930 LDY aliens+1,X:LDA ali
ens,X:TAX:JSR convert
 1940 LDA #exdata MOD256:STA
 pdata+1:LDA #exdata DIV256:
STA pdata+2
 1950 LDX #4:LDY #17:JMP pri
nt
 1960 .erase
 1970 LDA aliens+4,X:STA ali
ens+2,X
 1980 LDY aliens+1,X:LDA ali
ens,X:TAX:JSR convert
 1990 LDA #blank MOD256:STA
pdata+1:LDA #blank DIV256:ST
A pdata+2
 2000 LDX #4:LDY #17:JMP pri
nt
 2010 .alien_ok
 2020 INC aliens+1,X:LDY ali
ens+1,X
 2030 CPY #197:BNE aok
 2040 LDA #2:STA aliens+3,X
 2050 JSR power
 2060 .aok
 2070 LDA aliens,X:TAX:JSR c
onvert
 2080 LDA #sprdata MOD256:ST
A pdata+1:LDA #sprdata DIV25
6:STA pdata+2
 2090 LDX #4:LDY #17:JMP pri
nt
 2100 .new_alien
 2110 DEC aliens+2,X:BNE ma_
exit
 2120 LDA #0:STA aliens+1,X:
TAY
 2130 LDA aliens,X:TAX:JSR c
onvert
 2140 LDA #sprdata MOD256:ST
A pdata+1:LDA #sprdata DIV25
6:STA pdata+2
 2150 LDX #4:LDY #17:JMP pri
nt
 2160 .ma_exit
 2170 LDX #0:.loop DEX:BNE l
oop
 2180 RTS
 2190
 2200 .aliens
 2210 EQUS STRING$(10*dim,CH
R$0)
 2220
 2230 .print
 2240 STX columns:STY rows
 2250 LDX #0:LDY #0
 2260 LDA new:STA temp:LDA n
ew+1:STA temp+1
 2270 .loop1
 2280 LDA rows:STA temprows
 2290 .loop2
 2300 .pdata LDA &3000,X:STA
(new),Y
 2310 INX
 2320 LDA new:AND #7:CMP #7:
BEQ pb
 2330 INC new:BNE pnext:INC
new+1:JMP pnext
 2340 .pb
 2350 LDA new:ADC #&38:STA n
ew:LDA new+1:ADC #1:STA new+
1
 2360 .pnext
 2370 DEC temprows:BNE loop2
 2380 LDA temp:ADC #8:STA ne
w:STA temp:LDA temp+1:ADC #0
:STA new+1:STA temp+1
 2390 DEC columns:BNE loop1
 2400 RTS
 2410
 2420 .convert
 2430 LDA #0:STA new+1:TXA:A
SL A:ASL A:ROL new+1:ASL A:R
OL new+1:STA new
 2440 TYA:AND #7:ADC new:STA
 new:LDA new+1:ADC #0:STA ne
w+1
 2450 TYA:LSR A:LSR A:LSR A:
ASL A:TAY
 2460 LDA table,Y:ADC new:ST
A new:LDA table+1,Y:ADC new+
1:STA new+1
 2470 RTS
 2480
 2490 .table
 2500 OPT FNtable
 2510
 2520 .blank
 2530 EQUS STRING$(17*4,CHR$
0)
 2540 OPT FNsprite_data
 2550 .missdata EQUW &3030:E
QUD &03030303:EQUW &0303:EQU
D 0
 2560 ]
 2570 NEXT
 2580 ENDPROC
 2590
 2600 DEF FNtable
 2610 FOR i=0 TO 31
 2620 [OPT pass:EQUW &5800+i
*&140:]
 2630 NEXT
 2640 =pass
 2650
 2660 DEF FNsprite_data
 2670 RESTORE
 2680 sprdata=P%:exdata=sprd
ata+4*17
 2690 FOR i=0 TO 2*4*17-1 ST
EP 4
 2700 READ a$
 2710 [OPT pass:EQUD EVAL("&
"+a$):]
 2720 NEXT
 2730 =pass
 2740
 2750 REM SPRITE
 2760 REM X=4/Y=17
 2770 DATA 3010000,7343412,7
060707,3010303,690F0006,C1C1
E1E1,F0F0F0F,F0F0844
 2780 DATA F000000,38787869,
F0F0F38,F01220F,F,840C0800,E
0EC2C2,C0E060E,60C080C
 2790 REM EXPL
 2800 REM X=4/Y=17
 2810 DATA 100,2000100,10002
,100,20000,30401004,4030B1B1
,2000410,4000000
 2820 DATA 20800200,C0D8D8C0
,28020,4,8,4040008,800,8
```

STAYING IN THE SHADOWS

In Part II of his Master Ram Board series CHRIS NIXON shows how to handle large amounts of text

HOPEFULLY some of you have already been dabbling a little, poking and peeking your hidden ram using the methods I explained in last month's issue.

If there is still some doubt about how to go about it safely, read on as I'll show you how to use the lower 12k of bank zero as a huge text storage area.

For those of you who missed Part I of the series, we are exploring ways of using the unused memory provided by Slogger's Master Ram Board, and you can still catch up with the action this month because the programs are fully self-contained.

The short piece of machine code from last month's article is going to stay with us for the duration of the series, as it is the central core of all the utilities I will be presenting.

And to keep things straightforward, I will be resorting to using machine code for other purposes only where strictly necessary.

Take a look at Program I. It is a collection of three short procedures, which when used together provide a sort of ram filing system.

Making sure that you are in 64k mode, type in Program I and save it. Don't try to run it in its present form, as it is designed to be merged on to the end of an existing Basic program, and so must first be spooled to tape or disc.

Type *SPOOL ASCII and press Return, making sure you have a disc in the drive or a tape in the recorder. Now list the program, pressing Shift to scroll if necessary. When the Basic prompt re-appears, type *SPOOL by itself and press Return.

The program is now stored in Ascii format, ready for attaching to any Basic program which is to work in shadow ram and also needs extra text storage space.

Program II is just such a program, so type NEW and enter the listing. When you have finished, rewind the tape if using one, and type *EXEC ASCII.

The recently spooled file will be added line by line to Program II in memory. Ignore any syntax errors which may appear.

You can list the program and see that Programs I and II are indeed merged. It would be wise at this point to save the complete program to avoid having to merge both programs again if something unfortunate should happen.

Program II is just a demonstration of how to use the procedures from Program I, but before you run the merged program an explanation of what Program I does is needed.

PROCassem assembles our shadow ram poke and peek routines, and should be called with PROCassem at the start of any program using these procedures.

PROCput stores any string in ram bank zero, using a similar method to the example listing from last month. The two parameters are the string to be stored and its ram file number.

The file number is very important. In order to be able to find your strings at a later date, a file number is needed to indicate where in bank zero ram they are held.

It works by assuming that a fixed record length is being used, which means the length of any strings stored is dictated by the variable *size%* – pre-set to 50 by Program II.

PROCput places a string in the hidden ram at locations which are multiples of whatever value is currently in *size%*.

In this case the file number tells it how many chunks of 50 bytes must be skipped over before placing the string.

A carriage return character – CHR$(13) – is added to the end of all stored strings, so PROCget knows when each one ends. PROCget

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```
30000 DEFPROCassem
30010 DIM code% 100
30020 FORpass%=0TO2STEP2
30030 P%=code%:[OPT pass%
30040 .get
30050 LDA #0:PHA:PLP:JMP &FB
FD
30060 .put
30070 PHA:LDA #&40:PHA:PLP
30080 PLA:JMP &FBFD
30090 ]:NEXT:ENDPROC
30100 :
30110 DEFPROCput(S$,P%)
30120 LOCAL A%,X%,Y%,L%
30130 IF LEN(S$)>=size% VDU7
:PRINT"String too long:"S$:
STOP
30140 ptr%=size%*P%
30150 FORL%=1TOLEN(S$)
30160 X%=ptr% MOD 256
30170 Y%=ptr% DIV 256
30180 A%=ASC(MID$(S$,L%,1))
30190 CALL put:ptr%=ptr%+1
30200 NEXT:A%=13
30210 X%=ptr% MOD 256
30220 Y%=ptr% DIV 256
30230 CALL put:ENDPROC
30240 :
30250 DEFPROCget(P%)
30260 LOCAL A%,X%,Y%,L%
30270 ptr%=size%*P%
30280 S$="":REPEAT
30290 X%=ptr% MOD 256
30300 Y%=ptr% DIV 256
30310 A%=USR(get)AND &FF
30320 S$=S$+CHR$(A%)
30330 ptr%=ptr%+1
30340 UNTILA%=13:S$=LEFT$(S$
,LEN$-1)
30350 ENDPROC
```

Program I

```
10 REM String store
20 REM By Chris Nixon
30 REM (c) Electron User
40 REM
50 MODE 6:PROCassem
60 size%=50:FORL%=0TO4
70 INPUTLINE"TEXT ",A$
80 PROCput(A$,L%):NEXT
90 PRINT'':FORL%=0TO4
100 PROCget(L%):PRINTS$
110 NEXT:END
```

Program II

◀ From Page 23

also needs you to specify a file number, which again is multiplied by the current value of *size%* to calculate the address at which the string is stored.

It then retrieves the string and places it in *S$* character by character until it finds the carriage return marker.

You can only change the value of *size%* to allow storage of strings up to 255 characters long, because Basic cannot handle strings bigger than this.

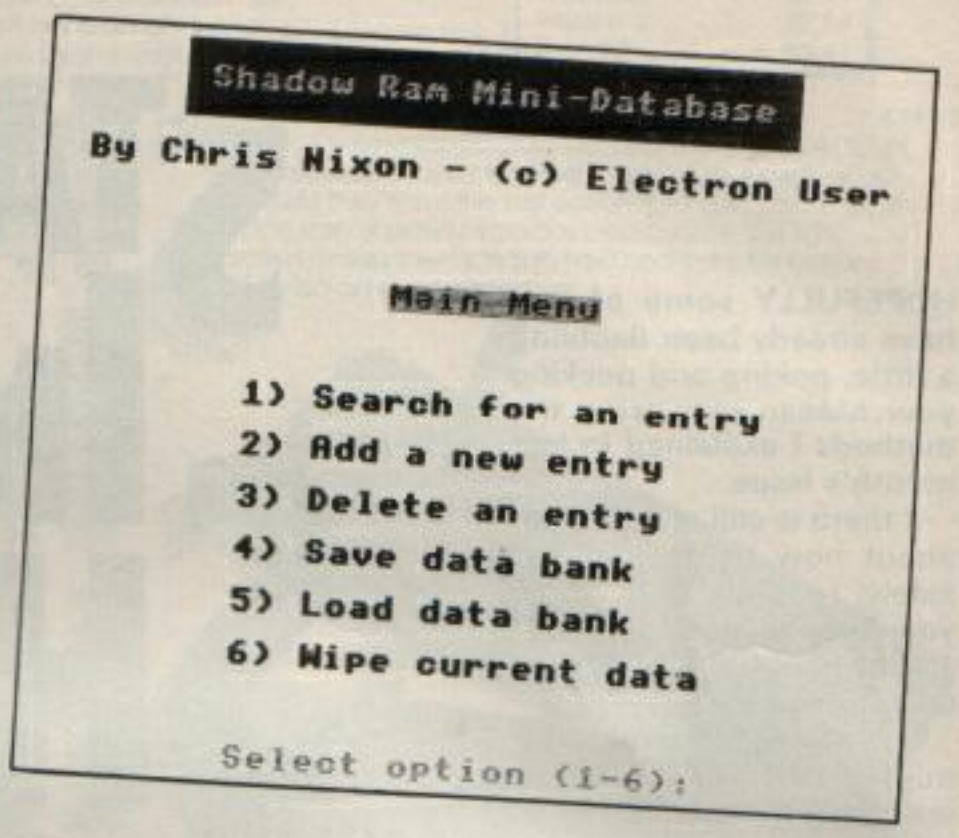
Remember that if the record size is too long, after 40 or 50 strings you may begin to corrupt the screen memory, which is just above our 12k storage space in bank zero.

This won't affect your program in the slightest, but it will disturb the strings stored in this area the next time anything is printed on screen. Note also that changing the value of *size%* mid-way through a program is not recommended, because unless you are very sure of what you are doing you could corrupt previously stored strings.

Now you can run the merged program, which will ask you to type in five lines of text. When you have finished, all five lines will be printed again on the screen. Not very inspiring, you might think, and with good reason.

Program II really illustrates the power of the procedures in Program I, because no variables were used to store the five lines of input – apart from *A$* and *S$*, which are just temporary data carriers between the main program and the store/retrieve procedures.

You could adapt the program to store up to 245 different strings of 50 bytes each – even in Modes 0, 1 and 2.



Moving on to Program III, we have yet another way of utilising the procedures from Program I, in the form of a mini database which uses bank zero for its storage space. Again, type NEW, enter Program III, rewind your tape and type *EXEC ASCII.

What you now have is a program which utilises the unused 12k in bank zero as a sort of ram disc. Although a touch slow, you should appreciate that it is entirely written in Basic.

The database allows up to 120 entries, each 100 bytes long. Use it for addresses, telephone numbers, filing your record collection or anything you like.

When you add an entry to the database, type it in as a continuous string; full-stops and commas are accepted, because of Basic's INPUT LINE command.

When you display an entry it will be neatly formatted, with no words broken over the end of a line.

Included in the database is an option to save the whole lower 12k of bank zero which holds our data to tape or disc.

To achieve this, the program uses simple sequential file handling techniques involving no more commands than OPENIN, OPENOUT, PRINT# and INPUT#. The real nitty-gritty is still performed by PROCput and PROCget.

● *That little lot should keep you going until next month, when I'll show you how to have two 12k programs in memory at the same time.*

```
  10 REM Mini Database
  20 REM By Chris Nixon
  30 REM (c) Electron User
  40 REM
  50 ONERRORGOTO440
  60 MODE 1:PROCassem
  70 PROCsetup:REPEAT
  80 PROCmenu:UNTIL0
  90 DEFPROCsetup:size%=101
 100 IFZ%=69 ENDPROC ELSE Z
%=69:A$=CHR$0:FORL%=0TO119:P
ROCput(A$,L%):NEXT:ENDPROC
 110 DEFPROCmenu:PROCtitle(
"Shadow Ram Mini-Database"):
PRINTTAB(3,5)"By Chris Nixon
 - (c) Electron User":COLOUR
1:COLOUR130:PRINTTAB(16,10)"
Main Menu":COLOUR3:COLOUR128
 120 PRINT''SPC10"1) Searc
h for an entry"
 130 PRINT'SPC10"2) Add a n
ew entry"
 140 PRINT'SPC10"3) Delete
an entry"
 150 PRINT'SPC10"4) Save da
ta bank"
 160 PRINT'SPC10"5) Load da
ta bank"
 170 PRINT'SPC10"6) Wipe cu
rrent data"
 180 PRINT''SPC10;:COLOUR2
:PRINT"Select option (1-6):
";:COLOUR3:REPEAT:G%=GET-48:
UNTILG%>0 AND G%<7
 190 ONG%GOTO200,210,220,23
0,250,260
 200 PROCsearch:ENDPROC
 210 PROCadd:ENDPROC
 220 PROCdelete:ENDPROC
 230 PROCsave:ENDPROC
 240 STOP
 250 PROCload:ENDPROC
 260 PROCwipe:ENDPROC
 270 DEFPROCtitle(T$):LOCAL
 L%:CLS:COLOUR2:COLOUR129:FO
RL%=1TO3:PRINTTAB(19-LENT$/2
,L%)STRING$(LENT$+2," "):NEX
T:PRINTTAB(20-LENT$/2,2)T$:C
OLOUR3:COLOUR128:ENDPROC
 280 DEFPROCjustify(J$):pt%
=1:ct%=1
 290 C%=INSTR(J$," ",pt%):I
FC%=0 PRINTRIGHT$(J$,LENJ$-p
t%+1):ENDPROC
 300 sz%=C%-pt%+1:ct%=ct%+s
z%:IFct%>40 PRINT:ct%=1:GOTO
 290
 310 PRINTMID$(J$,pt%,sz%);
:pt%=pt%+sz%:GOTO 290
 320 DEFPROCdelete:PROCtitl
e("DELETE an entry"):L%=0:IN
PUT''"String to search for
",s$:IFs$="" s$=CHR$13
 330 PROCtitle("SEARCHING -
 Please wait ..."):REPEAT:PR
OCget(L%):F%=INSTR(S$,s$):L%
=L%+1:UNTILL%=120 OR F%>0:IF
 F%=0 ENDPROC
 340 PROCtitle("Press D to
delete, SPACE to search"):PR
INTTAB(0,10):PROCjustify(S$)
:REPEAT:G%=GET:UNTILG%=32 OR
 G%=ASC"D":IF G%=32 GOTO330
ELSE L%=L%-1:A$=CHR$0:PROCpu
t(A$,L%):ENDPROC
 350 DEFPROCsearch:PROCtitl
e("SEARCH for an entry"):L%=
0:INPUT''"String to search
 for ",s$:IFs$="" s$=CHR$13
 360 PROCtitle("SEARCHING -
 Please wait ..."):REPEAT:PR
OCget(L%):F%=INSTR(S$,s$):L%
=L%+1:UNTILL%=120 OR F%>0:IF
 F%=0 ENDPROC
 370 PROCtitle("Press SPACE
 to search for more"):PRINTT
AB(0,10):PROCjustify(S$):REP
EAT:UNTILGET=32:GOTO360
 380 DEFPROCadd:PROCtitle("
ADD an entry"):PRINT'':REP
EAT:INPUTLINE"Input entry ",
s$:UNTILLENs$<size%:PROCtitl
e("Looking for a free slot .
..")
 390 L%=0:REPEAT:PROCget(L%
):L%=L%+1:UNTILL%=120 OR S$=
CHR$0:IF S$<>CHR$0 PROCtitle
("No free slots - SPACE for
Main Menu"):REPEAT:UNTILGET=
32:ENDPROC
 400 L%=L%-1:PROCput(s$,L%)
:ENDPROC
 410 DEFPROCsave:PROCtitle(
"SAVE data bank"):INPUT''"
Filename ",F$:CH%=OPENOUT F$
:FORL%=0TO119:PROCget(L%):PR
INT#CH%,S$:NEXT:CLOSE#0:ENDP
ROC
 420 DEFPROCload:PROCtitle(
"LOAD data bank"):INPUT''"
Filename ",F$:CH%=OPENIN F$:
FORL%=0TO119:INPUT#CH%,S$:PR
OCput(S$,L%):NEXT:CLOSE#0:EN
DPROC
 430 DEFPROCwipe:PROCtitle(
"WIPE all entries - sure (Y/
N)?"):G$=GET$:IF G$="Y" PROC
title("Wiping - please wait
..."):A$=CHR$0:FORL%=0TO119:
PROCput(A$,L%):NEXT:ENDPROC
ELSE VDU7:ENDPROC
 440 IF ERR=17 RUN
 450 PROCtitle("ERROR - Pre
ss SPACE for Main Menu")
 460 REPORT:REPEAT:UNTILGET
=32:RUN
```

Program III

CHARTING YOUR SUCCESS

Part 3 of CHRIS NIXON's series on ViewSheet shows you how to produce instant bar charts

I SHOWED you last month how to use ViewSheet to predict future profit and loss in a small software company.

Now we'll take a look at how to keep the boss happy, by producing encouraging bar charts of the year's profits to pin on his wall.

In the process we'll be tackling two of ViewSheet's other powerful functions – windows and replication – and afterwards, hopefully dispel some of the mystery associated with these features.

First though, I want you to load in last month's Clever Soft profit calculator sheet, and add to it the spreadsheet description in Listing I, using the method I described last time.

If you are in Mode 0 or 3, you should end up with a display similar to Figure I. This is a mock-up of Clever Soft's monthly profits, from January through to December.

The value shown in slot B30 is taken directly from January's net profit column in slot C18, and to simplify things all the other monthly results have been invented just for our bar chart.

I mentioned that ViewSheet deals with three types of slot contents – labels, values and formulae – and if a slot contains a formula ViewSheet will always display its result, rather than the actual slot contents.

Slot	Contents
A30	90.125
A31	88.34
A32	85.75
A33	83.925
A34	79.64
A35	74.391
A36	79.914
A37	88.692
A38	125.254
A39	140.657
A40	170.264
A41	236.518

Listing I

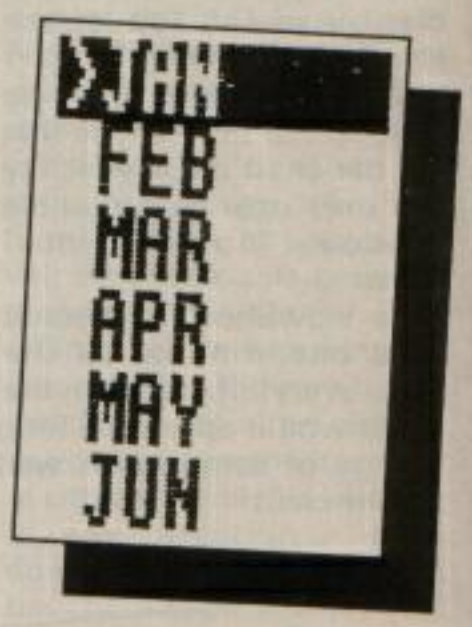
What I didn't point out was that there are actually two ways of displaying a value or a formula's result.

ViewSheet is, if directed, capable of representing a slot's value by a row of asterisks, the exact number being determined by the value or result of a formula in the slot. This is, of course, rounded to the nearest whole number.

For instance, if slot A1 contains the value 32, or if it contains a formula whose result is 32, then a row of 32 asterisks could be displayed instead, starting at the first character of the slot and extending toward the right of the screen. It is this feature that enables us to create bar charts from all sorts of sheet layouts.

Imagine a column of 20 values, all represented instead by a row of asterisks and you can see how it works.

However, this method of displaying slot contents can



mess up the look of your sheet if not used with care, so there are certain conventions to be followed when setting up such a display.

The first involves the use of windows. ViewSheet is capable of partitioning the screen to show up to 10 different areas of your sheet at the same time. These partitions are known as windows, and are similar to Basic's text window facility.

Each one can only be as big as there is available room on screen, and usually

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```
LA  SLOT=B30
CONTENTS=JAN

JAN      90.125
FEB       88.34
MAR       85.75
APR      83.925
MAY       79.64
JUN      74.391
JUL      79.914
AUG      88.692
SEP     125.254
OCT     140.657
NOV     170.264
DEC     236.518

**************************
**************************
*************************
************************
***********************
**********************
***********************
**************************
***********************************
*****************************************
************************************************
*********************************************************************
```

Figure I: The sheet after entering Listing I

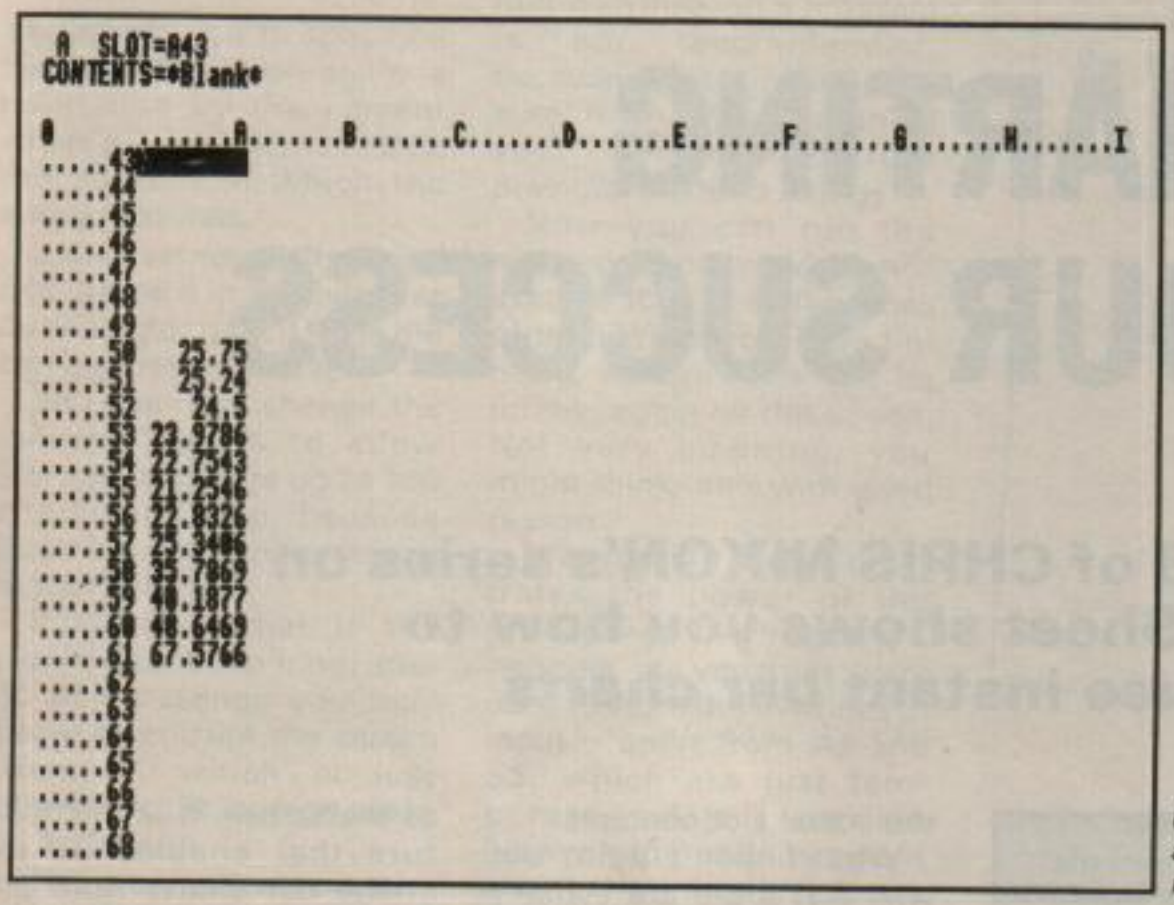


Figure II: The sheet after using the replicate function

◄ *From Page 25*

it is impractical to set up more than four at once. We are going to use just two windows, one in which to display our bar chart and the other to provide a constant display of the top of the sheet.

The main reason for using windows in this case is that the bar chart display facility can only operate on whole windows, not individual slots.

As ViewSheet by default uses one window all the time, everything else on the sheet would appear as long strings of asterisks as well as our chart!

We neatly avoid the problem by partitioning our screen half-way down, with the lower half set to display slots in bar chart format.

There are other advantages to using windows – each one is capable of independent scrolling in any direction, while all other windows stay put.

This means you can be occupied in the top window, changing values and moving around, while the bottom bar chart display remains stationary, but will be updated in real time as you fiddle about.

Now on to setting up our bar chart. Before we start work on the window setup, we must first use the profit mock-up table – which you have just entered – to create another table which will make up our bar chart.

The reason why we can't directly use the table shown in Figure I is that some of the values would go way off screen. What we need to do is create a second table where the results from the first are divided down a little before being displayed as a bar chart.

Move the slot cursor down the sheet to slot A50, and enter the formula: B30/3.5. You should immediately see the result, 25.75, appear under the cursor.

Dividing by 3.5 ensures that the finished bar chart will stay within the limits of the screen, unless the profits are made much larger.

In which case simply increase the division constant to four or more until the values look OK. The maximum displayable bar is 70 characters wide, so use this as your yardstick.

Now we need to copy this formula into A51-A61, using the same division formula. We could do this manually, slot by slot, but this is an ideal opportunity to introduce one of ViewSheet's most powerful features, replication.

Replication is called in whenever you need to copy a block of slot entries to another part of a sheet. It is fast, very flexible, and once mastered you can build extremely powerful sheets in a very short time.

Press Func+1, shown on the keycard as Replicate. You are prompted at the top of the screen: "From – To?". At this point we must examine the way replication will interpret your answer.

You can replicate just one slot at a time, in which case you would reply with: *slot1-slot2*, where slot1 is the slot you wish to copy and *slot2* is the destination. However, you can also copy a whole row or column at a time, and this needs a little more thought.

A contiguous group of slots is called a range and may lie either horizontally or vertically on the sheet. In our case we are interested in the vertical range A51-A61.

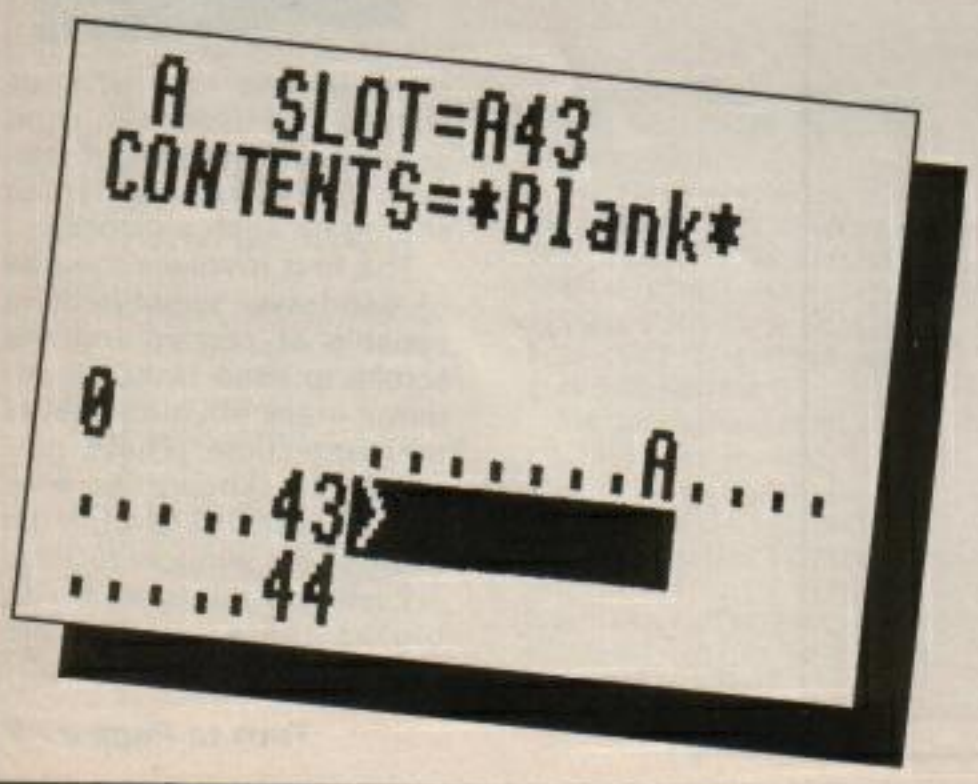
To copy slot A50 into all the slots in this range, we would reply to the "From – To?" prompt with: A50-A51A61. Look at this carefully and you will see how easy it is. We have simply entered the sheet reference for the slot we want to copy, followed by a dash, and the top and bottom slot references of our range.

Note the top and bottom of the range is run together with no space in between. This is vital to ViewSheet's interpretation of what we want to do, because replication can be applied in many different ways, and we need to be specific about what we want.

ViewSheet will attempt to copy the slot into the range as soon as you press Return, but will stop almost immediately with the query:

```
R)elative, N)o change?
B30/3.5
```

The slot reference B30 is inverted black on white, and what ViewSheet is asking is



whether you want the reference to slot B30 to be copied verbatim or be adjusted relatively for each slot it is copied into.

If this sounds confusing, think about it like this. If you pressed N at this point, signifying that you want to copy the formula verbatim, then every slot in the range A51-A61 would contain the same formula. Not much use for our purposes here.

Therefore press R and the formula will be adjusted relatively through all of the slots into which it is being copied. The result is that slot A51 will contain B31/3.5, A52 will contain B32/3.5, and so on.

Viewsheet always highlights any slot reference found during a replication and asks you this question. You must answer with care, because in a complex formula some slot references may have to remain the same throughout the replication process.

So in case you haven't already done so, press R in response to the replication prompt, and after half a second or so all the slots in the specified range will be filled with the formula from A50, but adjusted properly for their different vertical positions.

Check Figure II, which should be the same as your screen display at this point.

As I mentioned earlier, replication can take many forms, and we will cover the rest of them in later articles. Now we want to move on and create a twin-window display.

Press Func+2, labelled Edit Window on your keycard, and you will be greeted with the prompt "Window?". We first want to redefine the current window – which is number zero – so type 0 and press Return.

The current window definition will appear on the editing line, consisting of eight parameters printed below eight headings. The parameters control how wide and tall the window is, its position relative to others and various other functions.

With the arrow keys, move the cursor under the heading TopL, which is the slot reference of the current top left of the screen.

Overtype the value shown with A30 and move beneath the heading BotR, the slot reference for the current bottom right of the screen.

Again overtype the value shown, but this time with I41. This should ensure our top window now only shows the figures entered previously from Listing I.

Now move to below the heading Opt. This part contains the various option settings of the window, concerning how it is displayed. Type T, then S.

This means that we want to disable both the Top and Side margins for that window, thereby tidying the screen and at the same time allowing more to be displayed. Press Return, and the new definition will be digested.

If there is anything wrong with it, such as an illegal parameter, ViewSheet will beep and list the definition again ready for editing, with the cursor under the offending parameter.

If the new window is accepted, the screen will change immediately to look like Figure III. Notice that there is indeed no top or side margin any more.

This is the usual practice with finished sheets, as it looks much neater and allows more of the window to fit on screen.

Press Func+2 again, and this time answer the prompt with 1 and press Return. Move under TopL and overtype the value shown with A50. Move under BotR and type A61.

Now move under the heading Cw, which stands for column width and type 70. This parameter controls the width of all slots in that window and can be used if you need to display more text or bigger numbers. We are using it to allow up to 70 asterisks to be displayed per slot.

The window will be only one column wide, but it will fill the screen from left to right.

Now move under the Opt heading, which should read: TS0. The 0 means that the window is currently off, which is the default state of windows 1-9. Overtype this character with a C, which signifies that we want this window to be displayed in bar chart mode, and press Return.

Immediately you should have a screen that looks like Figure IV. Now you can see the year's profit as a much more readable bar chart. The exact figures are still displayed above for reference.

As you are inside window one at the moment, press Func+3 – Next Window – on your keycard. This key moves you from one window to another in sequence. As we only have two windows at present, it will act as a toggle between them.

Once in the top window, you can alter the values and watch the bar chart change as you experiment. You can, of course, scroll this window in any direction – even down to the location of the bar chart itself.

However, if you do this all you will see are the numeric values, because window zero is not set for bar chart mode.

Press Escape and save your new sheet, bearing in mind that not only will the current window definitions be saved along with the sheet, but also your current cursor position and the number of the window you were last in.

● *Next month we'll replace the dummy profit figures with full monthly breakdowns, and see our sheet really come to life.*

```
 A  SLOT=A22
CONTENTS=*Blank*

0      .......A.......B.......C.......D.......E.......F.......G.......H.......I
.....22
.....23
.....24
.....25
.....26
.....27
.....28
.....29
.....30 JAN       98.125
.....31 FEB        88.34
.....32 MAR        85.75
.....33 APR       83.925
.....34 MAY        79.64
.....35 JUN       74.391
.....36 JUL       79.914
.....37 AUG       88.692
.....38 SEP      125.254
.....39 OCT      148.657
.....40 NOV      178.264
.....41 DEC      236.518
.....42
.....43
.....44
.....45
.....46
.....47
```

Figure III: The finished sheet

LUCAS' PROBLEM

ARTHUR LINDON brings an old puzzle up to date

THIS puzzle was first put forward by the French mathematician Lucas around 100 years ago and presents an intriguing problem to the logically minded.

The game was originally played on a white wooden board using red and blue counters. Marked on the board were nine squares in a line.

The first four are occupied by four blue counters and the last four squares by red ones. Your objective is to swap the positions of the blue counters.

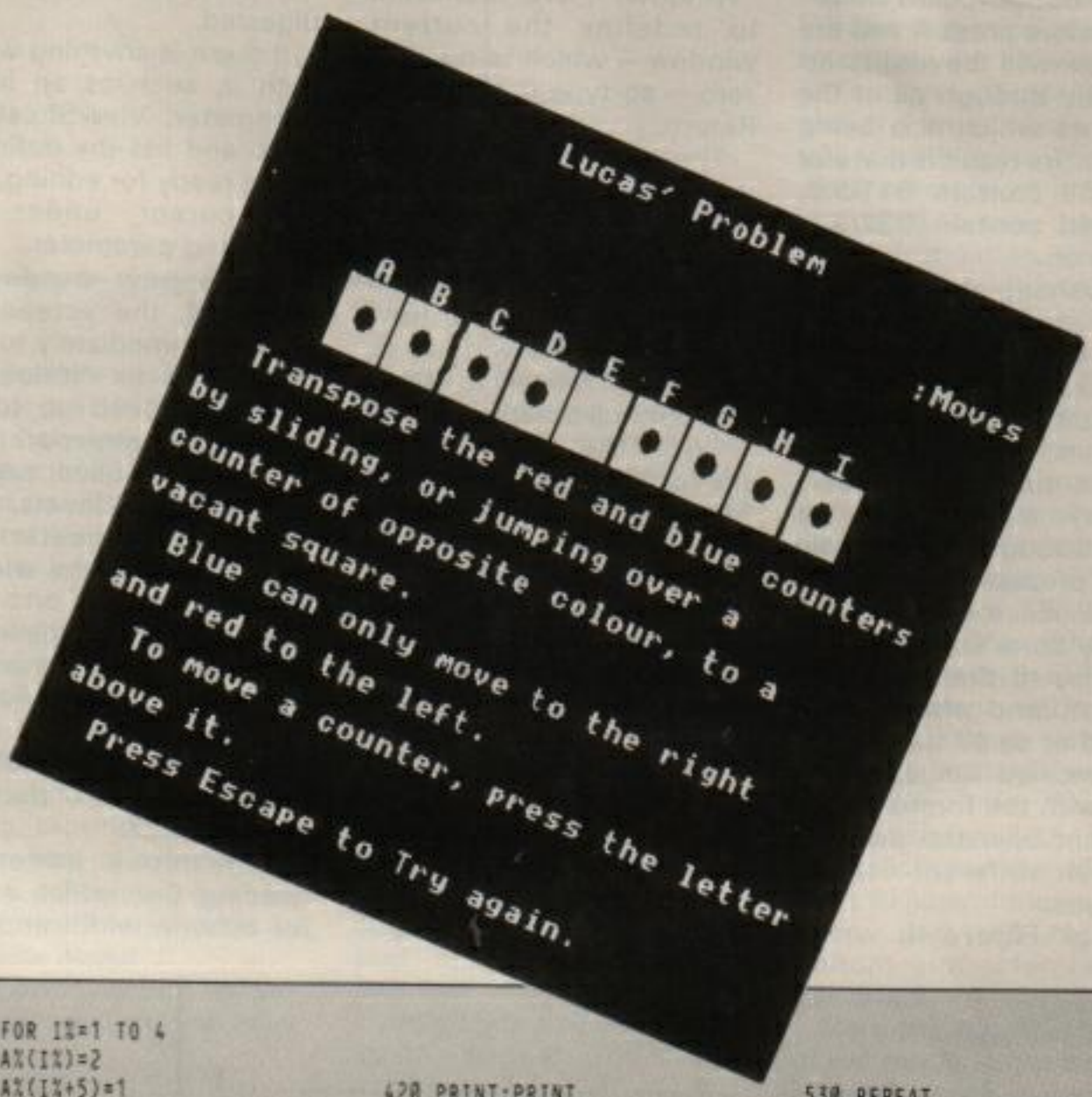
The moves are quite straightforward and there are only three rules to remember:

- Blue counters can only move right, while the red counters move left.
- If the square on the right of a blue counter or left of a red counter is vacant it can slide across.
- A counter can jump over one of the opposite colour providing there is a space beyond it.

To move a counter press the corresponding letter above it. If you get into a situation where you cannot move, press the Escape key to try it again.

The number of moves are recorded and at the end you'll be told how many you took. The aim is to take the least number of moves.

My best is 24. Can you beat this?




```
   10 REM Lucas' Problem
   20 REM By Arthur Lindon
   30 REM (c) Electron User
   40 ON ERROR RUN
   50 MODE 1
   60 VDU 23,224,60,126,255,
255,255,255,126,60
   70 DIM A%(9)
   80 VDU 19,2,4;0;19,0,3;0;
   90 COLOUR 130
  100 CLS
  110 VDU 28,6,11,32,9
  120 COLOUR 131
  130 CLS
  140 VDU 26
  150 VDU 23,1,0;0;0;0;
  160 GCOL 0,2
  170 FOR I%=284 TO 1020 STE
P 96
  180 MOVE I%,732
  190 DRAW I%,640
  200 DRAW I%+4,640
  210 DRAW I%+4,732
  220 NEXT
  230 FOR I%=1 TO 4
  240 A%(I%)=2
  250 A%(I%+5)=1
  260 COLOUR 2
  270 VDU 31,3*I%+4,10,224
  280 COLOUR 1
  290 VDU 31,3*I%+19,10,224
  300 NEXT
  310 COLOUR 130
  320 COLOUR 3
  330 FOR I%=1 TO 9
  340 VDU 31,3*I%+4,8,I%+64
  350 NEXT
  360 CNT%=0
  370 COLOUR 0
  380 PRINT TAB(13,1)"Lucas'
 Problem"TAB(33,4)":Moves"
  390 PRINT TAB(0,13)" Trans
pose the red and blue counte
rs by"
  400 PRINT" sliding or jum
ping over a counter of"
  410 PRINT" opposite colou
r to a vacant square."
  420 PRINT:PRINT
  430 PRINT" Blue can only
move to the right and"
  440 PRINT" red to the lef
t. To move a counter"
  450 PRINT" press the lett
er above it."
  460 PRINT:PRINT
  470 PRINT" Press Escape t
o try again."
  480 GCOL 0,3:MOVE 0,0:DRAW
 0,1023:DRAW 1278,1023:DRAW
1278,0:DRAW 0,0
  490 REPEAT
  500 COLOUR 130
  510 COLOUR 3
  520 IF A%(1)=1 AND A%(2)=1
 AND A%(3)=1 AND A%(4)=1 AND
 A%(6)=2 AND A%(7)=2 AND A%(
8)=2 AND A%(9)=2 PRINT TAB(1
2,4)"You've done it in":VDU7
:G=GET:END
  530 REPEAT
  540 K%=(GET AND 223)-64
  550 CNT%=CNT%+1
  560 PRINT TAB(30-(CNT%<10)
,4);CNT%
  570 UNTIL K%>0 AND K%<10
  580 COLOUR 131
  590 IF A%(K%)=2 PROCmove(1
,2) ELSE IF A%(K%)=1 PROCmov
e(-1,1)
  600 UNTIL FALSE
  610
  620 DEFPROCmove(D%,C%)
  630 COLOUR C%
  640 IF A%(K%+D%)=0 A%(K%)=
0:A%(K%+D%)=C%:VDU31,3*K%+4,
10,32,31,3*K%+4+3*D%,10,224
ELSE IF A%(K%+D%)=3-C% AND A
%(K%+2*D%)=0 A%(K%)=0:A%(K%+
2*D%)=C%:VDU31,3*K%+4,10,32,
31,3*K%+4+6*D%,10,224
  650 ENDPROC
```

Get yourself in a flap with Skirmish!

SAVE UP TO £5

Sit astride a giant blue ostrich and engage in exciting futuristic jousting contests against opponewnts riding giant green buzzards.

This superb one-or-two-player game features beautifully animated sprites, with a plabability that's second to none.

"I can recommend Skirmish wholeheartedly. It is one of the most playable games I have ever seen and will certainly lead to a severe case of repeated late nights . . . Playability: 11 out of 10"

– Hac-Man, The Micro User, March 1988

Suitable for	Product	Format	RRP	Special reader offer	YOU SAVE	Offer including subscription	YOU SAVE
Electron	Skirmish	Tape	£9.95	£7.95	£2	£19.95	£5

TO ORDER PLEASE USE THE FORM ON PAGE 53

Adventure Anthology

This superb collection contains four of the best adventures taken from the pages of Electron User. In addition there is an unpublished masterpiece written by Bill Trevelyan, one of the magazine's foremost contributors. They range from mini adventures ideally suited to the novice adventurer, right through to large, complex programs containing many mind-boggling puzzles designed to test the most experienced player.

The Golden Crown: The King has been robbed of his crown by a devious adversary. A knighthood and countless wealth is promised to whosoever can recover the crown.

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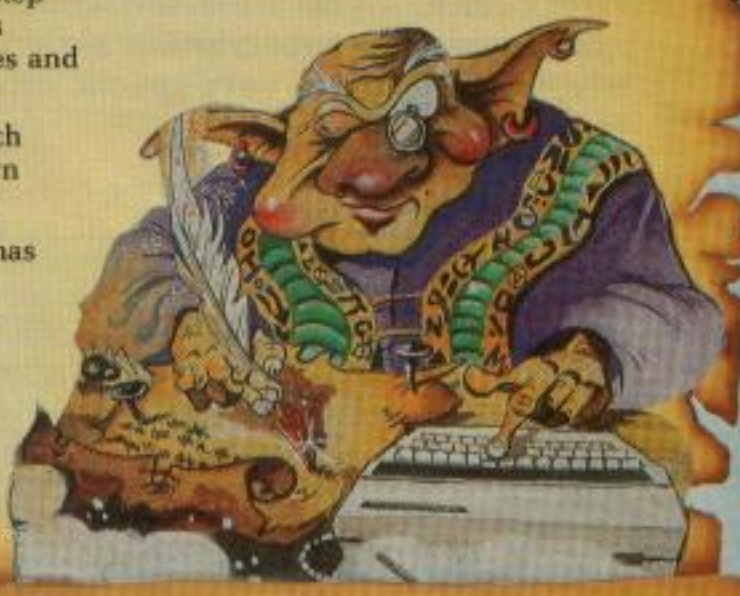

These exciting adventures will keep you engrossed for weeks – and at less than £1 each this has to be one of the best bargains for intrepid adventurers ever devised.

Only **£4.95**

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3 TANTALISING TITLES FOR YOUR ACORN ELECTRON!

Computer Hits 10 Vol. 4

SAVE UP TO £6!

Some of the very best games for the Electron have been crammed onto two cassettes – and they're guaranteed to keep you entertained for months!

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This is a compilation that's not to be missed!

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Control AI, the globular droid, in a revenge mission against the eight rebellious planets of the Ryvian system. Ransack, the latest game from top programmer Peter Scott, is a high-speed arcade game that will tax your skill and reactions to the limit!

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– *Guilder*, Electron User, *January 1987*

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Here's an exciting new collection of screens for you to try and crack! Start out as a baby and work your way through the five different life stages, from infancy to old age – a total of 40 new mazes with a dazzling range of graphics. It's just what you've been waiting for! And the Repton 3 main program is included with every copy.

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– *Ian Waugh, Electron User, January 1988.*

Please note: If you are a subscriber, you can renew your subscription early to take advantage of these very special offers.

Suitable for	Product	Format	RRP	Special reader offer	YOU SAVE	Offer including subscription	YOU SAVE
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Electron	Ransack	Tape	£9.95	£6.95	£3	£18.95	£6
Electron	Life of Repton	Tape	£6.95	£5.45	£1.50	£17.95	£4
Electron	Life of Repton	5¼ Disc	£7.95	£5.95	£2	£18.95	£4

TO ORDER TURN TO THE FORM ON PAGE 53

More room for your roms

CHRIS NIXON looks at the new Pres Advanced Plus 6

WHEN Acorn first designed the Electron it was always intended to be capable of supporting up to 16 roms at once, just like the BBC Micro.

Therefore the BBC Micro's operating system was duplicated (almost) in full on the Electron ready for this eventuality, despite the fact that the standard machine was provided with no spare rom sockets.

So it wasn't until the release of Acorn's Plus 1 expansion that roms could be added to the Electron, and then only by the use of rom cartridges.

These were – and still are – relatively expensive and only two dual-rom cartridges could be inserted into the Plus 1 at one time.

Since then several companies have produced sideways rom and ram boards to fill the gap left by the rather limited Plus 1 – you'll find a full review of them in the February 1987 issue of *Electron User*.

At one time a separate external rom board was available, but the manufacturers have since ceased production. This has left Slogger providing possibly the only Electron rom board, in the form of its own version of the Plus 1 – the Rombox Plus.

Now, for the first time, comes the Advanced Plus 6, or AP6 – a unit which not only allows up to six roms to be inserted into the board, but will also accept ram chips in any of the sockets.

Standard static ram chips can be bought cheaply and fitted into the sockets exactly as if they were roms.

This provides the ability to load rom images from disc into the ram chips – known as sideways ram when used in this fashion – as and when needed.

Here they will be treated as physical roms by the Electron, and once loaded rom images will remain in ram until the power is turned off. (It's worth noting that the extra ram can't be used for Basic programs.)

This allows you, in effect, much more than just the Electron's 16 rom maximum, without having to physically insert and remove rom chips – a potentially damaging task if repeated frequently on the same roms.

What's more, sideways ram provides the perfect environment for writing your own roms, if you are so inclined.

This isn't as difficult as you may think – anyone with a smattering of 6502 machine code knowledge can write a rom, using some of the many books on the subject as tutorials.

We published an article on how to write your own rom in the February 1986 issue of *Electron User*.

The AP6 is quite a breakthrough for its designers, Pres, and as the unit is mounted unobtrusively inside an existing Plus 1 it reduces the number of gadgets hanging off the back of your Electron.

The only snag is that you must already have an Advanced Plus 1 from Pres in which to place the AP6.

Owners of the original Acorn Plus 1 will have to either set soldering iron to PCB to make the necessary alterations, or they can add £7 (plus VAT) to their order for a complete upgrade service. Of course the old Plus 1 must be posted with your order if going for the upgrade.

The unit is a marvellous piece of design, strong, neat and compact, and it won't crowd the Plus 1 to the point of overheating.

Each socket is easily accessed with a screwdriver for removing roms, unlike some boards where delicate capacitors always seem to be in the way.

Using static ram chips in place of rom/eproms is achieved by simply inserting them in any of the sockets, but they must be 32k chips rather than the cheaper 8k ones.

The AP6 worked perfectly and I was able to use all my Electron roms indiscriminately in any of the six sockets, with no problems.

One point worth noting: If you have the Acorn Plus 3, only five of the six sockets will be available for other roms. Owners of ACP's own disc interfaces will not be affected, as these sit in the Plus 1 cartridge slots.

Coming soon from Pres is the AP7. This is an enhancement for the AP6 which will provide two 16k banks of battery backed sideways ram with full write-protect option.

This will mean that while the write-protect is on, rom images will remain in the machine after the power is switched off, and will be – to all intents and purposes – permanent roms.

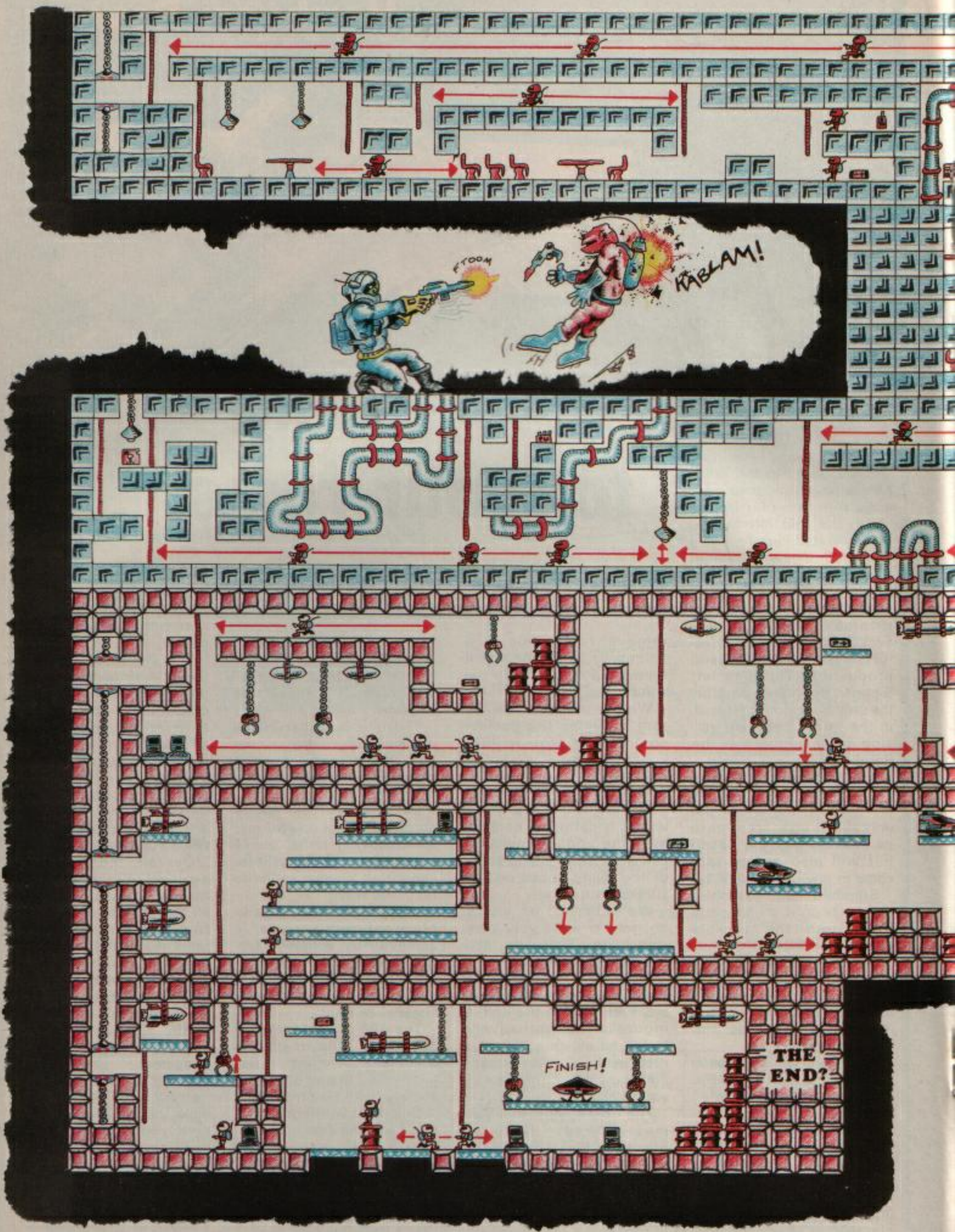
Some links on the AP6 board are provided in readiness for the AP7, and these are simply changed over when you fit the new board.

Overall, the AP6 is an excellent unit, providing for the first time in one package all the aspects of sideways rom and ram expansion facilities your Electron needs.

Together with the AP7, the AP6 will make your Electron just about as powerful in the sideways rom/ram department as can be imagined.

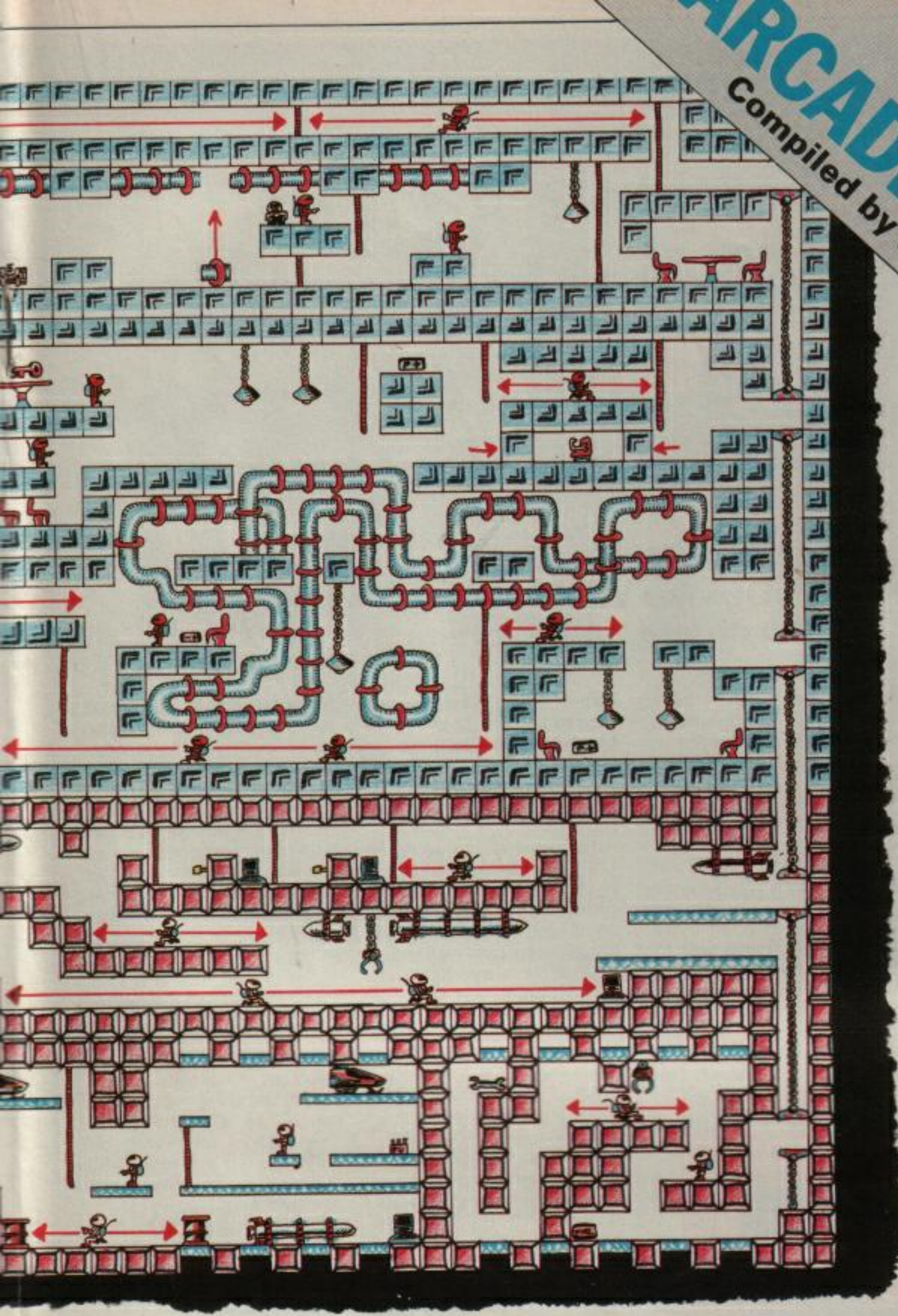
If you are a serious Electron user and don't already have the facilities provided by the AP6 in other forms, don't hesitate – buy it.

Product: Advanced Plus 6
Price: £37.95
Supplier: PRES, 6 Ava House, High Street, Chobham, Surrey GU24 8LZ
Tel: 0276 72046


KABLAM!
FINISH!
THE END?

Electron User ARCADE CORNER

Compiled by MARTIN REED



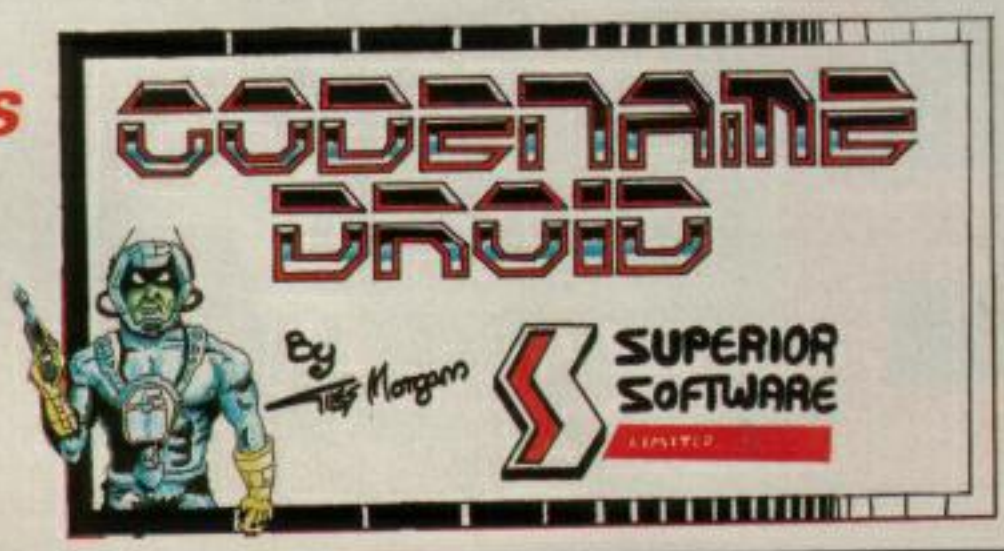
KEY

- Energy cell
- Passcard
- Micro film
- Plutonium rods
- Mystery package
- Jet-pack
- Rom, navigation
- Key
- Spring
- Spanner
- Remote activator
- Control button
- Computer disc
- 'Herbert' droid
- Fuel for jet-pack

STRYKER'S RUN

Part 3

The Map



Pouring gallons of graphics into the Electron's pint-sized memory

In Part 4 of his sprites series ROLAND WADDILOVE shows how to create multi-screen games

WE have been looking so far at different ways of printing sprites and have developed quite an array of machine code print routines, including ones that will move sprites in front and behind other objects on the screen.

We'll leave this topic for the moment and see how the screen displays for large multi-screen arcade games are created.

The techniques used in both this and next month's article will show how top-selling games such as Superior Software's Citadel, Palace of Magic and Repton are written.

As you'll know if you've played these games, there can be up to 100 beautifully drawn screens featuring superb graphics. So how are these all squeezed into the Electron's small memory? A single Mode 5 screen is 10k, and two is 20k, and on top of this of course, room must be left for the program itself.

As I promised last month, I'm going to show you a powerful method of compacting Mode 5 – or Mode 2 for that matter – screens into as little as eight bytes.

Enter and run Program I to see the technique in action. Tap the spacebar to flick through the screens – there are five in all, though many more could easily be put in.

They are labelled *scr0, scr1, scr2* ... in the listing, and each consists of two EQUD statements. So how is it done?

Each screen is built up from blocks five bytes wide by 32 bytes high. As the Mode 5 screen is 40 bytes wide, eight blocks will fit neatly across the screen.

And as there are eight bits in a byte, each row of blocks can be stored in a single byte – each bit set indicating the presence of a block. The screen is 256 bytes deep so we can fit eight 32-byte high blocks down it. So there are eight rows of eight blocks all stored in just eight bytes of data. Simple when you know how.

This means you could fit 128 Mode 5 screens in just 1k of ram. And assuming the code for an arcade game takes around 5k, you could easily squeeze well over 1,500 screens into memory.

The chunk of assembly language at the start of the program – lines 340 to 470 – decodes the compacted screen data and decides whether to call *print* to draw a block or *blank* to print a blank space.

It's worth examining how the screens are stored. You'll see a table of pointers at line 510 holding the address of each screen.

The screen number is used to index into this table to find the real address of the screen data – stored in lines 580 to 620.

The main problem with Program I is the lack of variety and the chunky blocks making up the screen display. There is only one type of block and that's brick – fine if you like hundreds of screens made up of bricks, but it can get a bit monotonous.

You could design a different type of block, but the screens would still be made up of this single type. What is needed is a slightly more advanced technique that will allow us to add variety.

Enter and run Program II. There are only two screens this time – though you can add many more – but they are far more complex than in Program I. Tap the spacebar to flick between them.

The screen data is stored at the end of the listing, so take a look at this first. What I have done this time is to use 4 byte wide by 24 byte high blocks.

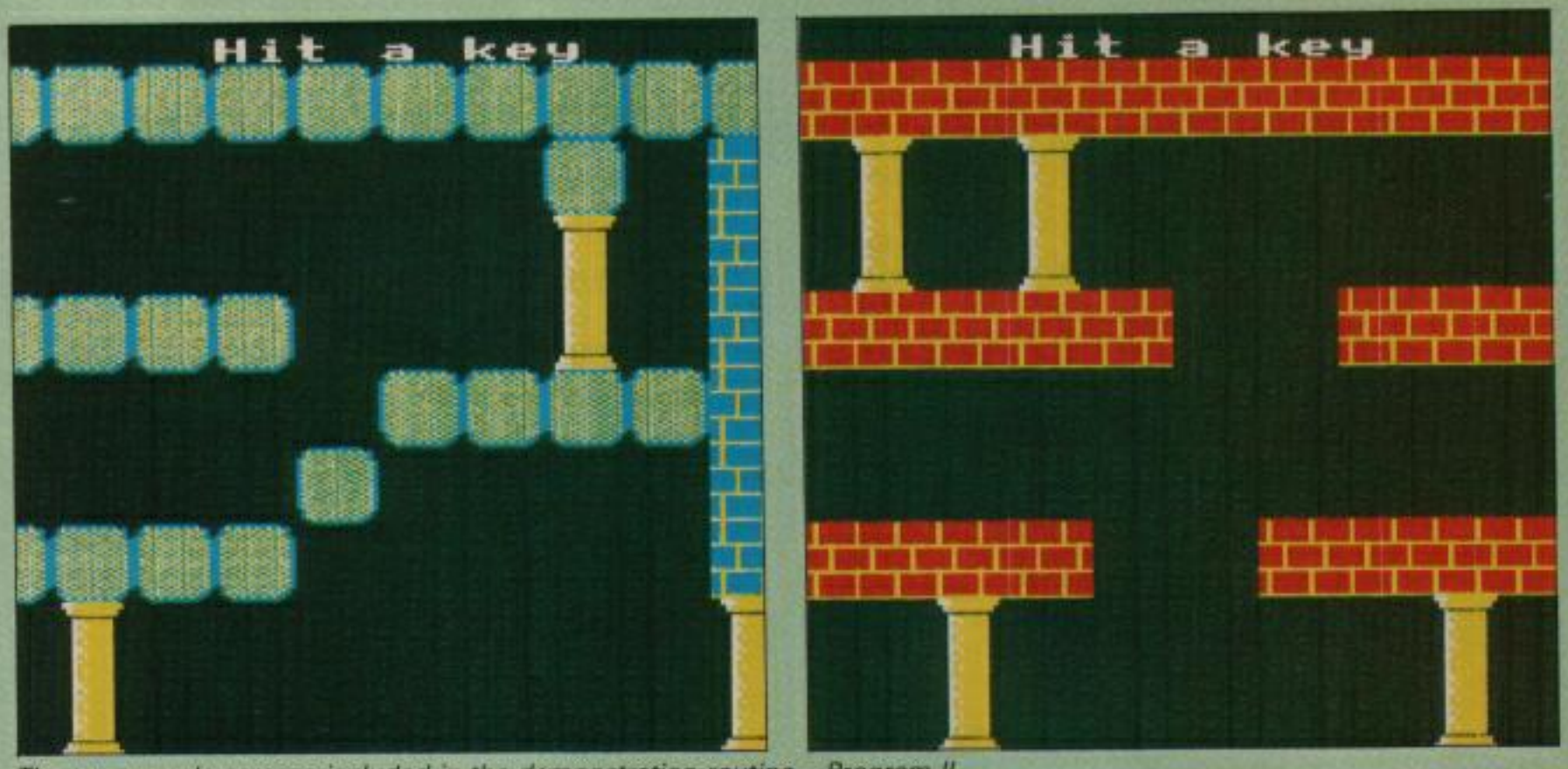
Exactly 10 blocks will fit across the screen and there can be 15 different types. The reason for having 15 block types is that we can fit the numbers zero to 15 in one nybble.

There are two nybbles in a byte, so we need five bytes per row of blocks. We can also fit 10 blocks down the screen – leaving a couple of spare lines for the score, lives, energy and so on – so this makes a total of 50 bytes per screen.

Although this is not as compact as Program I's screens, remember that each screen in Program II can be made up from any combination of 15 types of block.

This program gives us far more variety and some quite complex screen displays can easily be built up –

A typical screen from Program I



The two sample screens included in the demonstration routine – Program II

at the expense of a few extra bytes of memory. Still, you can fit 20 screens in 1k of ram, or well over 250 in an average length arcade game.

You'll see a table of pointers to screen addresses in the listing starting at line 980 and the screen number is used to index into this. Although there are only two entries, you can add as many as you like.

There's also a 96 times multiplication table at line 570. This is because each screen block is made up of 96 bytes of data and each entry is used to index into the sprite data table to pick out the correct block for printing.

● *Next month I'll continue with the same theme of maps, but move on to scrolling ones like those used in Ravenskull and the Repton series of games.*

Special: Arcade game creator

ALL the programs from this series revealing the secrets of writing fast-action arcade games have been put on a special cassette (£3.95) and disc (£4.95). On it you'll find everything you need to create your own machine code games.

The programs include:

- *A Mode 5 sprite editor for designing your own multicoloured characters.*
- *A selection of fast print routines that will move sprites both in front or behind other objects on the screen.*
- *Map generators that will squeeze a Mode 5 screen into eight bytes.*
- *Scrolling maps.*
- *Score print routines*

. . .and much more. This is an offer no aspiring games programmer can afford to miss!

To get this great offer, use the order form on page 53.

Program I

```
   10 REM Maps 1
   20 REM By R.A.Waddilove
   30 REM (c) Electron User
   40 PROCassemble
   50 MODE 5:VDU23,1,0;0;0;0
;:*FX16
   60 COLOUR131:COLOUR0
   70 A%=0
   80 REPEAT
   90 CALL &900
  100 PRINT TAB(5,1)"Hit  Sp
ace"
  110 A%=(A%+1)MOD 5
  120 UNTIL GET=FALSE
  130 END
  140
  150 DEF PROCassemble
  160 map=&50
  170 addr=&51
  180 xcount=&53:ycount=&54
  190 taddr=&55
  200 index=&57
  210 FOR pass=0 TO 2 STEP 2
  220 P%=&900
  230 [ OPT pass
  240 SEI
  250 ASL A:TAY  \screen*2
  260 LDA table,Y:STA screen
+1:LDA table+1,Y:STA screen+
2
  270 LDY #&58:STY addr+1:LD
Y #&00:STY addr
  280 STY index
  290 LDA #8:STA ycount
  300 .yloop
  310 LDA addr:STA taddr:LDA
 addr+1:STA taddr+1
  320 LDY index
  330 .screen LDA &3000,Y:ST
A map
  340 LDA #8:STA xcount
  350 .xloop
  360 ASL map:BCC block
  370 LDA addr:STA new+1:LDA
 addr+1:STA new+2
  380 JSR print:JMP skip
  390 .block
  400 LDA addr:STA bloop+1:L
DA addr+1:STA bloop+2
  410 JSR blank
  420 .skip
  430 LDA addr:ADC #5*8:STA
addr:BCC m1:INC addr+1:.m1
  440 DEC xcount:BNE xloop
  450 LDA taddr:ADC #(4*&140
)MOD256:STA addr:LDA taddr+1
:ADC #(4*&140)DIV256:STA add
r+1
  460 INC index
  470 DEC ycount:BNE yloop
  480 CLI
  490 RTS
  500
  510 .table
  520 EQUW scr0
  530 EQUW scr1
  540 EQUW scr2
  550 EQUW scr3
  560 EQUW scr4
  570
  580 .scr0 EQUD &21AB89FF:E
QUD &FF8188A8
  590 .scr1 EQUD &84D591FF:E
QUD &EFA581BF
  600 .scr2 EQUD &F59581FF:E
QUD &F791BD05
  610 .scr3 EQUD &89ABA9BD:E
QUD &FF9185ED
  620 .scr4 EQUD &BF1185FF:E
QUD &F794B581
  630
  640 .print
  650 LDA #brick MOD256:STA
ploop+1:LDA #brick DIV256:ST
A ploop+2
  660 LDX #4
  670 .loop
  680 LDY #5*8-1
  690 .ploop
```

Turn to Page 36 ▶

◀ From Page 35

```
700 LDA brick,Y:.new STA &5800,Y
710 DEY:BPL ploop
720 CLC:LDA new+1:ADC #&40:STA new+1:LDA new+2:ADC #&1:STA new+2
730 LDA ploop+1:ADC #40:STA ploop+1:BCC p1:INC ploop+2:.p1
740 DEX:BNE loop
750 RTS
760
770 .blank
780 LDX #4
790 .loop
800 LDY #5*8-1
810 LDA #0
820 .bloop
830 STA &5800,Y
840 DEY:BPL bloop
850 CLC:LDA bloop+1:ADC #&40:STA bloop+1:LDA bloop+2:ADC #&1:STA bloop+2
860 DEX:BNE loop
870 RTS
880
890 .brick
900 OPT FNdata
910 ]
920 NEXT
930 ENDPROC
940
950 DEF FNdata
960 RESTORE
970 FOR I%=0 TO 5*32-1 STEP 4
980 READ a$
990 [ OPT pass
1000 EQUD EVAL("&"+a$)
1010 ]
1020 NEXT
1030 =pass
1040
1050 REM Brick
1060 DATA F0F0F0F,F00F0F0F,4B4B4B4B,F04B4B4B,F0F0F0F,F00F0F0F,4B4B4B4B,F04B4B4B,F0F0F0F,F00F0F0F,2D2D2D2D,F02D2D2D,F0F0F0F,F00F0F0F,2D2D2D2D,F02D2D2D,F0F0F0F,F00F0F0F,4B4B4B4B,F04B4B4B,F0F0F0F,F00F0F0F,4B4B4B4B,F04B4B4B,F0F0F0F
1070 DATA F00F0F0F,4B4B4B4B,F04B4B4B,F0F0F0F,F00F0F0F,2D2D2D2D,F02D2D2D,F0F0F0F,F00F0F0F,2D2D2D2D,F02D2D2D,F0F0F0F,F00F0F0F,4B4B4B4B,F04B4B4B
```

Program II

```
10 REM Maps 2
20 REM By R.A.Waddilove
30 REM (c) Electron User
40 PROCassemble
50 MODE 5:VDU23,1,0;0;0;0;
60 PRINT TAB(6,1)"Hit a key"
70 A%=0
80 REPEAT
90 CALL &900
100 VDU19,1,1+3*(A% AND 1);0;
110 A%=(A%+1)MOD 2
120 UNTIL GET=0
130 END
140
150 DEF PROCassemble
160 map=&50
170 addr=&52
180 xcount=&54
190 ycount=&55
200 index=&56
210 new=&70
220 FOR pass=0 TO 2 STEP 2
230 P%=&900
240 [ OPT pass
250 SEI
260 ASL A:TAY \screen*2
270 LDA table,Y:STA map \map address
280 LDA table+1,Y:STA map+1
290 LDA #&80:STA addr \screen address
300 LDA #&5A:STA addr+1
310 LDY #0:STY index \map byte index
320 LDY #10:STY ycount
330 .yloop
340 LDA addr+1:PHA:LDA addr:PHA
350 LDA #5:STA xcount
360 .xloop
370 LDA addr:STA new:LDA addr+1:STA new+1
380 LDY index
390 INC index
400 LDA (map),Y \get map byte
410 PHA
420 LSR A:LSR A:LSR A:LSR A \left block
430 JSR print
440 LDA addr:ADC #4*8:STA new
450 LDA addr+1:ADC #0:STA new+1
460 PLA
470 AND #&0F                 \right block
480 JSR print
490 LDA addr:ADC #8*8:STA addr:LDA addr+1:ADC #0:STA addr+1
500 DEC xcount:BNE xloop
510 PLA:ADC #(3*&140)MOD256:STA addr
520 PLA:ADC #(3*&140)DIV256:STA addr+1
530 DEC ycount:BNE yloop
540 CLI
550 RTS
560
570 .mult
580 EQUW 0
590 EQUW 1*96
600 EQUW 2*96
610 EQUW 3*96
620 EQUW 4*96
630 EQUW 5*96
640 EQUW 6*96
650 EQUW 7*96
660 EQUW 8*96
670 EQUW 9*96
680 EQUW 10*96
690 EQUW 11*96
700 EQUW 12*96
710 EQUW 13*96
720 EQUW 14*96
730 EQUW 15*96
740
750 .print
760 ASL A:TAY \sprite*2
770 LDA mult,Y
780 ADC #sprites MOD256 \set data
790 STA ploop+1
800 LDA mult+1,Y
810 ADC #sprites DIV256
820 STA ploop+2
830 LDX #3
840 .ploop1
850 LDY #31
860 .ploop
870 LDA &3000,Y:STA (new),Y
880 DEY:BPL ploop
```



```
890 CLC
900 LDA new:ADC #&40:STA new
910 LDA new+1:ADC #&1:STA new+1
920 LDA ploop+1:ADC #32:STA ploop+1
930 LDA ploop+2:ADC #0:STA ploop+2
940 .p1
950 DEX:BNE ploop1
960 RTS
970
980 .table
990 EQUW scr0
1000 EQUW scr1
1010
1020 OPT FNscrdata
1030
1040 .sprites
1050 EQUS STRING$(96,CHR$0)
1060 OPT FNsprdata
1070
1080 ]
1090 NEXT
1100 ENDPROC
1110
1120 DEF FNsprdata
1130 RESTORE 1220
1140 FOR I%=0 TO 4*4*24-1 STEP 4
1150 READ a$
1160 [ OPT pass
1170 EQUD EVAL("&"+a$)
1180 ]
1190 NEXT
1200 =pass
1210 REM Brick
1220 DATA 2D2D2D2D,F02D2D2D,F0F0F0F,F00F0F0F,2D2D2D2D,F02D2D2D,F0F0F0F,F00F0F0F,F0F0F0F,F00F0F0F,4B4B4B4B,F04B4B4B,F0F0F0F,F00F0F0F,4B4B4B4B,F04B4B4B,2D2D2D2D,F02D2D2D,F0F0F0F,F00F0F0F,2D2D2D2D,F02D2D2D,F0F0F0F,F00F0F0F
1230 REM Pillar bottom
1240 DATA 0,0,FAFCFCF8,F8FCFCF8,F0F0F0F0,F0F0F0F0,0,0,0,0,FCF8F8FA,FCFCF8FA,F0F0F0F0,F0F0F0F0,0,0,0,33331111,F8FAF8,F8F0F8F0,F0F0F0,F0F0F0F0,0,C0C08080
1250 REM Pillar top
1260 DATA 11113333,0,F0F0F8F0,FAFCF800,F0F0F0F0,F0F0F000,8080C0C0,0,0,0,F8FCFCF8,FCFCF8FA,F0F0F0F0,F0F0F0F0,0,0,0,0,F8FCF8FA,F8F8FAF8,F0F0F0F0,F0F0F0F0,0,0
1270 REM Stone
1280 DATA 2D162503,2D5A2D5A,A55AA50F,A55AA55A,A55AA50F,A55AA55A,864A8608,A54BA54B,2D5A2D5A,2D5A2D5A,A55AA55A,A55AA55A,A55AA55A,A55AA55A,A54BA54B,A54BA54B,255A2D5A,1122516,A55AA55A,F5AA55A,A55AA55A,F5AA55A,A54BA54B,80C864A
1290
1300 DEF FNscrdata
1310 RESTORE 1480
1320 scr0=P%
1330 scr1=P%+50
1340 FOR K%=0 TO 1
1350 FOR Y%=1 TO 10
1360 READ a$
1370 FOR X%=1 TO 5
1380 [ OPT pass
1390 EQUB EVAL("&"+LEFT$(a$,2))
1400 ]
1410 a$=MID$(a$,3)
1420 NEXT
1430 NEXT
1440 NEXT
1450 =pass
1460
1470 REM Screen 1
1480 DATA 1111111111
1490 DATA 0303000000
1500 DATA 0202000000
1510 DATA 1111100111
1520 DATA 0000000000
1530 DATA 0000000000
1540 DATA 1111001111
1550 DATA 0030000030
1560 DATA 0020000020
1570 DATA 1111111111
1580
1590 REM Screen 2
1600 DATA 4444444444
1610 DATA 0000000401
1620 DATA 0000000301
1630 DATA 4444000201
1640 DATA 0000044441
1650 DATA 0000400001
1660 DATA 4444000001
1670 DATA 0300000003
1680 DATA 0200000002
1690 DATA 1111111111
```

This listing is included in this month's cassette tape offer. See order form on Page 53.

Happy event to tame the wind

JOE PRITCHARD continues his series on building the Electron weather station

WE constructed a simple anemometer for measuring wind speed last month, and considered a simple Basic program which could be used with the hardware to calculate the approximate number of revolutions per second.

We also found the major problem with such a simple program is that it hangs up when no pulses are coming into the PB input.

The solution is to use events – the interrupts of the Electron. An event is an occurrence, such as the completion of a conversion of the analogue to digital converter, which can cause the Electron's 6502 to leave what it's doing and run a second program.

The clever thing is that once the second program has completed its activities the 6502 can take up where it left off on the first program, hopefully with no ill effects.

The first program is said to be interrupted by the event, and the second one is often called an interrupt service routine, as it often carries out some particular task in response to the event.

It should, however, leave all the CPU registers with the same values they held when the routine was entered, and on the Electron should take no more than a couple of milliseconds to complete.

One event supported by the Electron is the interval timer crossing zero event, where an interrupt is generated by an interval timer when it reads zero. This is accessed using osword 3 and 4, and is incremented 100 times a second.

To generate an event after, say, five seconds we set the timer to –500 and start it off. Five seconds later the event is triggered and all we need to do is write a routine to use this event.

The program listed here shows how I've used the event just described to solve the problem we had last time when no pulses are coming in.

The counting loop is in Basic, but the REPEAT ... UNTIL loops now check the value in address &70 as well as the status of the PB line.

The event is used to ensure address &70 is set to hold a value of one after five seconds, and this exits the loop even if a full rotation of the anemometer disc hasn't occurred.

How does this work? Let's take a quick look at the program. Lines 50 to 70 initialise the number printing format, set up the machine code and set the screen mode.

Lines 80 to 180 form the counting loop, similar to the program we saw last month. The only difference is the presence of the ?&70 at the end of lines 100, 120 and 130.

It also prints "Still Air" if the time-out caused by the event occurring finished the loop, rather than a revolutions count.

Line 90 kicks off the event timer by calling PROCevent_on, and line 160 disables it by calling PROCevent_off.

Lines 200 to 540 assemble the machine code. The label

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```
  10 REM Pulse Counting
  20 REM By Joe Pritchard
  30 REM (c) Electron User
  40 :
  50 PROCassemble
  60 @%=&20209
  70 MODE 6
  80 REPEAT
  90 PROCevent_on
 100 REPEAT:UNTIL(ADVAL(0)A
ND3)=10R?&70=1
 110 TIME=0
 120 REPEAT:UNTIL (ADVAL(0)
AND3)=0OR?&70=1
 130 REPEAT:UNTIL(ADVAL(0)A
ND3)=10R?&70=1
 140 T=TIME/100:IF ?&70=0T=
1/T ELSE T=0
 150 IF T=0 PRINTTAB(6,10)"
Still air!                "
ELSE PRINTTAB(6,10)T;"   Rev
s. per Second  "
 160 PROCevent_off
 170 UNTIL FALSE
 180 END
 190 :
 200 DEFPROCassemble
 210 DIM code% 100
 220 DIM clock 20
 230 FOR pass=0 TO 2 STEP 2
 240 P%=code%
 250 [
 260 OPT pass
 270 .event_service
 280 PHA
 290 PHP
 300 LDA #1
 310 STA &70
 320 PLP
 330 PLA
 340 RTS
 350 :
 360 .event_on
 370 LDX #clock MOD 256
 380 LDY #clock DIV 256
 390 LDA #4
 400 JSR &FFF1
 410 LDA #14
 420 LDX #5
 430 JSR &FFF4
 440 RTS
 450 :
 460 .event_off
 470 LDA #13
 480 LDX #5
 490 JSR &FFF4
 500 RTS
 510 :
 520 ]
 530 NEXT pass
 540 ENDPROC
 550 :
 560 DEFPROCevent_on
 570 !clock = &FFFFFE0C: cl
ock?4 = &FF
 580 old_event=?&220
 590 old_event1=?&221
 600 ?&220=event_service MO
D256
 610 ?&221=event_service DI
V256
 620 ?&70=0
 630 CALL event_on
 640 ENDPROC
 650 :
 660 DEFPROCevent_off
 670 ?&220=old_event
 680 ?&221=old_event1
 690 CALL event_off
 700 ENDPROC
```

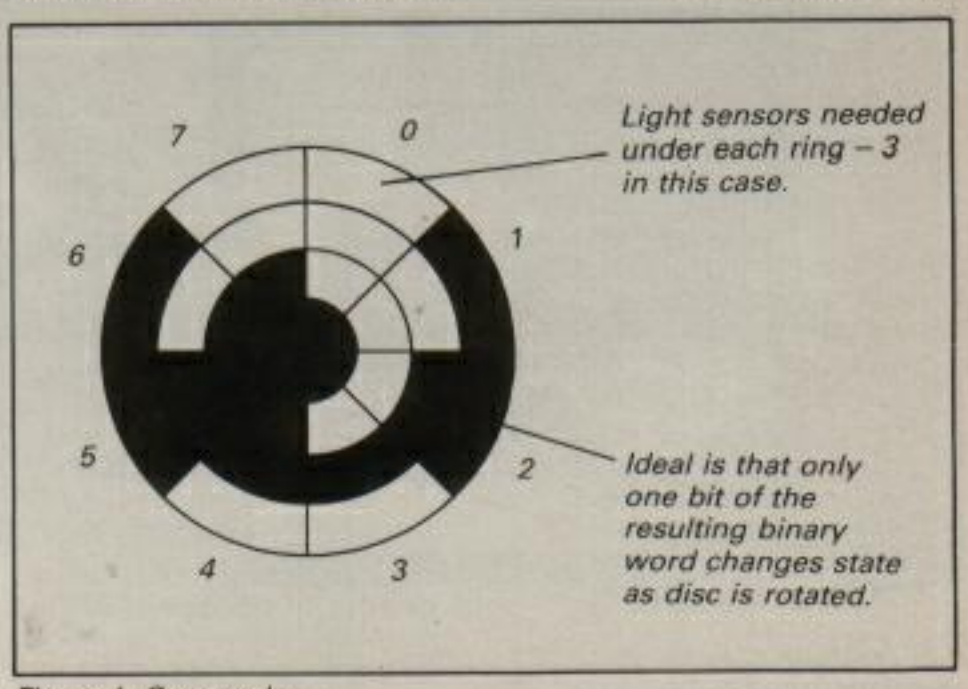

Figure I: Grey code

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event_service is our interrupt routine. The processor status register and the accumulator are stored on the stack.

The contents of &70 is set to one and the registers are restored before the routine finishes. This is only called when the interval timer reaches zero.

Lines 360 to 440 are responsible for setting up the clock using osword 4 and then enabling the relevant event using osbyte 14. Lines 460 to 500 disable the event using osbyte 13.

Lines 560 to 640 are responsible for loading a five byte block of memory *clock* – with the value –500. The interval timer counts up from this value and generates the event when crossing zero.

The usual contents of &220 and &221 – the event vector – are copied into the variables *old_event* and *old_event1*.

The event vector is reset to point to the *event_service* routine. Finally, a call to *event_on* starts things up.

Lines 660 to 700 disable the event and restore the normal event vector contents.

Running this program will cause the routine to exit every five seconds with the message "Still Air" if it was caused by the time-out. Otherwise the count of revolutions per second will be displayed.

If you're interested in a more general application for this program you could write the counting loop in machine code as well, which would allow recording of higher rates of revolutions. However, as it stands it should be suitable for most locations, even in Basic.

The anemometer is a little awkward to calibrate into km/h (mph for the traditionalists), and so is really only useful for comparative readings. If anyone comes up with a calibration method for the anemometer please let me know.

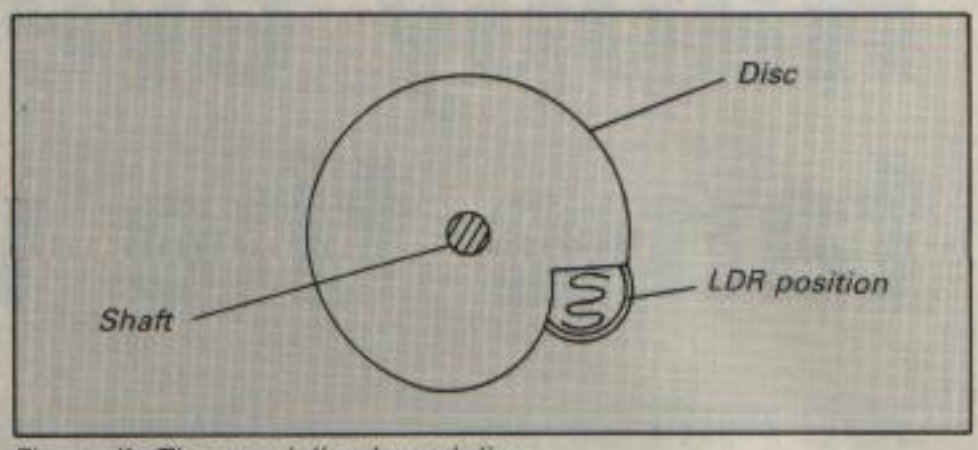

Figure II: The specially shaped disc

Wind direction

Converting wind direction into an electronic signal isn't easy. Most methods use something called a grey code shaft position encoder, shown in Figure I.

The problem here is that four separate digital inputs to the computer are required. This isn't too much of a problem on, say, the BBC Micro, where we've got an 8 bit digital input port.

However, on the Electron we don't have such a luxury, so we have to use a different technique.

The method I used uses a specially-shaped disc and an LDR/light bulb combination, as shown in Figures II, III and IV.

As you can see, the disc is shaped like a cam rather than a circle. At different positions of shaft rotation the disc will cover a different amount of the LDR surface, and so will interrupt the light falling on it to a greater or lesser degree.

Thus the resistance of the LDR will be dependant upon the position of the shaft. If we connect the shaft to a wind vane the resistance of the LDR will be related to the position of the vane, and hence wind direction.

This method is not as accurate as the one shown in Figure I, but is cheaper to set up and does not require four digital input lines. (In a couple of month's time I'll be building a 6522 VIA port for the Electron, and anyone interested might like to try the grey code method then).

The preset resistor in Figure III forms the other half of a potential divider, turning the resistance into a voltage in the range 0 to 1.8 Volts.

We need to provide a light source for this project, as the LDR/disc assembly really needs to be boxed for protection. I used a torch bulb – 6V, 40mA – and ran it from the 5V output of the Electron Plus 1.

Remember that the bulb will get warm, so it should be mounted a few centimetres away from the disc/LDR, but close enough to provide sufficient light. You should also consider putting ventilation holes in the box.

The only complication with this method is the shaping of the disc. It needs to be opaque – thick plastic card or cardboard will do the trick.

It's a good idea to cut a disc out in thin card first and try rotating it on the shaft to get a reasonable voltage change as the shaft is rotated.

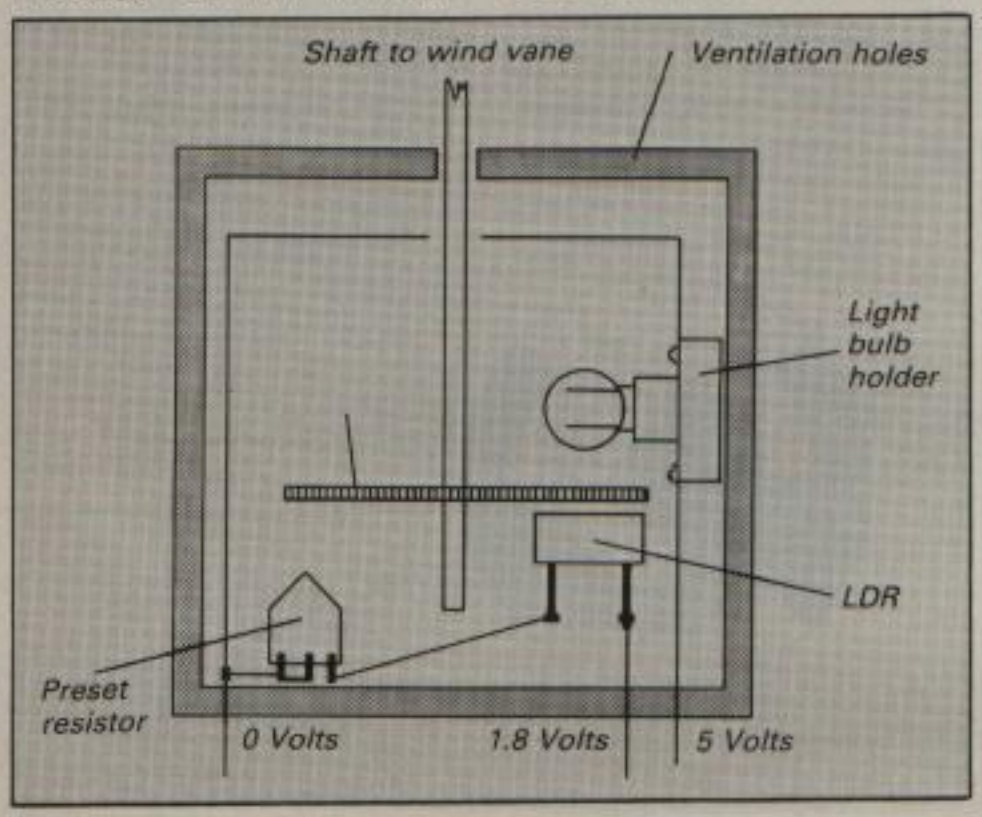

Figure III: Wind vane circuit

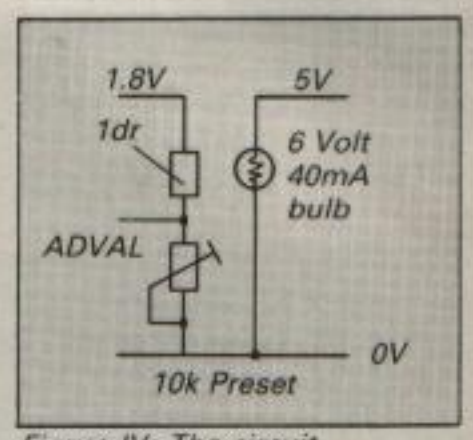

Figure IV: The circuit

The software for testing the wind vane can be a simple loop to read values back from the ADVAL channel to which you've connected the potential divider output.

Rotate the shaft and disc, and make sure there is a reasonable voltage change over the whole rotation. The preset resistor can be adjusted to bring the voltage into the middle of the zero to 1.8V swing that can be recorded by the ADC.

The full software to convert readings from the windvane into directions will be given next month, when I'll also pull together the different parts of the weather station project.

● *I'll also provide a simple program to monitor all the hardware interfaces and display results to the screen or printer or save information to a file.*

LION'S LAIR

Get your words in apple pie order with this fun educational game by STEPHEN and ANDREW WEIR

LION'S Lair is a great game for children who are learning to spell, and up to four can play at once, making it much more fun.

A number of friendly lions have wandered on to your screen, each with a name printed below it. The idea is to arrange the lions in alphabetical order, and as the game becomes more difficult more lions begin to appear.

Each player is allowed up to three mistakes before dropping out of the game, eventually leaving just one player as the winner.

At first just two lions will be on your screen. Using the spacebar, move the two large arrows until they enclose the lion whose name comes alphabetically first.

Press Return to select that one as your choice, and its name will appear at the head of a list shown at the bottom of the screen.

Next, move the arrows to enclose the second lion and press Return again. Its name will appear below your previous selection.

If you have chosen correctly, a large tick will appear at the bottom right, otherwise you will be rewarded with a large cross. Two more lions will appear and the game continues until you have completed half a dozen screens or so.

Now you will have three lions to deal with, and eventually – if you are a very good speller – six will appear together.

If you can survive to the end, you can record your name in the high score table among the names of a few feline friends.

The game is thoroughly error-trapped and you can't select the same lion twice. Full instructions are printed at the start, and there is even a little background tune which you can turn on and off by pressing the 1 key.

PROCEDURES

assemble	Assembles machine code
instructions	Prints instructions
get_names	Gets the players' names
lion	Prints a lion
tune	Plays a tune

```
  10 REM Lions Lair
  20 REM By Andrew and Step
hen Weir
  30 REM (c) Electron User
  40 REM
  50 GOSUB70:REM Initialise
  60 PROCmain
  70 REM Initialise
  80 in=0
  90 MODE5
 100 sound%=-1:code=&900:PR
OCassemble
 110 *fx11,0
 120 *fx220,1
 130 *fx202,48
 140 *fx4,1
 150 ON ERROR MODE6:REPORT:
PRINT" at line ";ERL":END
 160 ONERROROFF
 170 DIMname$(5),level%(5),
score%(5),question%(5),wrong
%(5),hi$(11,2),pos%(5,6),wor
ds$(200),word$(6),answer%(6)
,answer$(6)
 180 RESTORE200:FORI%=1TO5:
FORJ%=1TOI%+1:READpos%(I%,J%
):NEXT:NEXT
 190 RESTORE210:FORI%=1TO10
:READhi$(I%,1),hi$(I%,2):NEX
T
 200 DATA4,6,4,5,6,1,3,7,9,
1,3,5,7,9,1,2,3,7,8,9
 210 DATATopcat,1000,Fluffy
,900,Purr,800,Leo,700,Tigger
,600,Paws,500,Rumtum,400,Mac
avity,300,Mistoffolees,200,G
us,100
 220 VDU23,140,170,85,170,8
5,170,85,170,85
 230 RETURN
 240 DEF PROCsprite_data
 250 DIM left 3*24+2,right
3*24+2,lion 56*8+2
 260 RESTORE1090:PROClocate
(lion)
 270 RESTORE1180:PROClocate
(left)
 280 RESTORE1210:PROClocate
(right)
 290 ENDPROC
 300 DEF PROClocate(loc) LO
CALbyte,data,count,offset,x,
y:READx,y:?loc=x:?(loc+1)=y:
loc=loc+2:byte=0:REPEAT READ
data:IFdata>=0byte?loc=data
 310 IFdata=-1READcount,dat
a:FORoffset=1TOcount:byte?lo
c=data:byte=byte+1:NEXT ELSE
 byte=byte+1
 320 UNTILdata=-9:ENDPROC
 330 DEF PROCassemble
 340 oswrch=&FFEE:osword=&F
FF1:new=&70:rows=&72:columns
=&73:temp1=&74:place=&76
 350 FORpass=0TO2STEP2:P%=c
ode:[OPTpass
 360 .d STAb:LDA#10:LDX#b A
ND255:LDY#b DIV256:JSRosword
:LDA#0:STAj:.d1 LDA#23:JSRos
wrch:LDAj:ORA#224:JSRoswrch:
```

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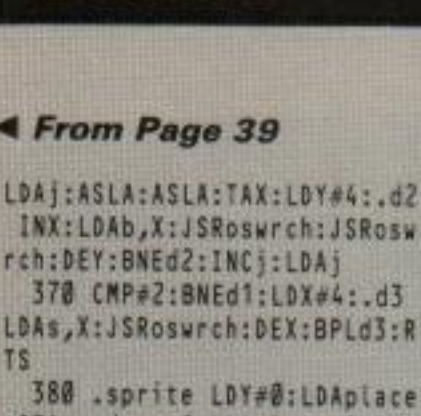
```
LDAj:ASLA:ASLA:TAX:LDY#4:.d2
 INX:LDAb,X:JSRoswrch:JSRosw
rch:DEY:BNEd2:INCj:LDAj
  370 CMP#2:BNEd1:LDX#4:.d3
LDAs,X:JSRoswrch:DEX:BPLd3:R
TS
  380 .sprite LDY#0:LDAplace
:STAnewdata+1:LDAplace+1:STA
newdata+2
  390 .loop1:LDAnew+1:STAtem
p1+1:LDAnew:STAtemp1:LDXrows
:.loop2:.newdata LDA &3000,Y
:EOR(new),Y:STA(new),Y:INCne
wdata+1:BNEp3:INCnewdata+2:.
p3 LDAnew:AND #7:CMP#7:BEQbo
ttom2
  400 INCnew:BNEp4:INCnew+1:
.p4 BNE next2
  410 .bottom2 CLC:LDAnew:AD
C#&39:STAnew:LDAnew+1:ADC#1:
STAnew+1:.next2:DEX:BNE loop
2:LDAtemp1:ADC#8:STAnew:LDAt
emp1+1:ADC#0:STAnew+1:DECcol
umns:BNEloop1:RTS
  420 .b:]:j=b+9:s=j+1:$s=CH
R$11+CHR$225+CHR$8+CHR$10+CH
R$224:NEXT:ENDPROC
  430 ENDPROC
  440 DEF PROCbig(A$) FORCH%
=1TOLENA$:A%=ASCMID$(A$,CH%,
1):CALLd:NEXT:ENDPROC
  450 DEF PROCmain
  460 REPEAT RESTORE1240:PRO
Cswitch(NOTin+2):PROCget_nam
es
```




```
  470 PROCbench:PROCplay:FOR
ch%=1TOplayers%:IFscore%(ch%
)>VAL(hi$(10,2)) PROCshunt(s
core%(ch%),name$(ch%))
  480 NEXT:UNTIL0
  490 DEF PROCtick GCOL3,3:M
OVE1000,40:DRAW1100,0:DRAW11
80,240:ENDPROC
  500 DEF PROCcross GCOL3,3:
MOVE1000,0:DRAW1190,150:MOVE
1190,0:DRAW980,140:ENDPROC
  510 DEF PROCwait(t) FORI%=
1TOt:PROCtune:NEXT:ENDPROC
  520 DEF PROCsprite(stored,
screen) !new=screen:!place=s
tored+2:?rows=?(stored+1):?c
olumns=?stored:CALLsprite:EN
DPROC
  530 DEFPROCinstructions VD
U12,22,4,23;8202;0;0;0;
  540 VDU17,129,17,0,28,0,3,
39,0,12,31,15,1:PROCbig("Lio
n's Lair"):VDU17,128,17,1,26
,31,0,6:PRINT"This is a game
 for up to five players.""
Up to six lions are displaye
d on the""screen at any on
e time, each with""their o
wn name."
  550 PRINT"The faster you c
an put the lions' names""i
n alphabetical order, the hi
gher the""score you get.
An arrow either side of""a
 lion indicates which lion i
s to be""chosen.  The keys
 are:"
  560 PRINT"SPACE to move ar
rows, RETURN to select.""T
 to toggle the sound OFF and
 ON.":IFNOTin PROCsprite_dat
a:in=TRUE
  570 *fx15
  580 VDU17,129,17,0,28,0,31
```

VARIABLES

name$()	Players' names
level%()	Players' level
score%()	Players' score
hi$()	High score table
player%	Current player
word$()	Lions' names

```
,39,29,12,17,0,31,13,1:PRINT
"Press SPACE BAR":ENDPROC
  590 DEFPROCswitch(s%) *fx1
5
  600 pitch%=0:uping%=-1:REP
EAT:IFs%=1 PROCinstructions
ELSE PROCdisplay
  610 TIME=0:REPEAT key%=INK
EY(1):PROCtune:IFkey%=ASC"T"
sound%=NOTsound%:*fx15
  620 UNTILkey%=32ORTIME>200
0:IFs%=1s%=2ELSEs%=1
  630 UNTILkey%=32:ENDPROC
  640 DEFPROCget_names VDU22
,4,23;8202;0;0;0;17,0,17,135
:PRINTSPC160;TAB(15,1);:PROC
big("Lion's Lair"):VDU28,0,3
1,39,4,17,128,17,1
  650 VDU31,11,5:PROCbig("Ho
w many players?"):REPEAT A=I
NKEY(1):PROCtune:UNTILA>=ASC
"1" AND A<=ASC"5":players%=A
-48:VDU28,0,5,39,6,12,31,12,
4:PROCbig("Enter your name")
:FORI%=1TOplayers%:VDU26,17,
128,17,1,31,15,12
  660 PROCbig("player "+STR$
I%):VDU17,129,17,0,28,11,19,
27,17,12,31,3,1:n$="":REPEAT
:PROCtune:A=INKEY(1):IF((A>=
ASC"A" AND A<=ASC"Z") OR (A>
=ASC"a" AND A<=ASC"z") OR A=
32) AND LENn$<11 n$=n$+CHR$A
 ELSE IFA=127AND LENn$>0 n$=
LEFT$(n$,LENn$-1)
  670 IFA=ASC"T"sound%=NOTso
und%:*fx15
  680 PRINTTAB(3,1)n$;" ":UN
TILA=13:name$(I%)=n$:IFname$
(I%)=""name$(I%)="Player "+$
TR$I%
  690 NEXT:*fx15
  700 ENDPROC
  710 DEF PROCshunt(s%,n$) h
i$(11,1)=n$:hi$(11,2)=STR$s%
:FORI%=11TO2STEP-1:IFVAL(hi$
(I%,2))>VAL(hi$(I%-1,2))S%=V
AL(hi$(I%,2)):hi$(I%,2)=hi$(
I%-1,2):hi$(I%-1,2)=STR$S%:N
$=hi$(I%,1):hi$(I%,1)=hi$(I%
-1,1):hi$(I%-1,1)=N$
  720 NEXT:ENDPROC
  730 DEFPROCcol(a,b) VDU23;
8202;0;0;0;19,1,a;0;19,2,b;0
;:ENDPROC
  740 DEF PROCbench VDU22,5:
PROCcol(1,3)
  750 VDU17,129,17,2:PRINTST
RING$(60,CHR$140):VDU5,18,0,
0:MOVE284,1000:PROCbig("Lion
's Lair"):VDU4,17,128:ENDPRO
C
  760 DEF PROCplay finished$
=STRING$(players%,"0"):PROCw
ords:uping%=0:FORI%=1TOplaye
rs%:level%(I%)=1:score%(I%)=
0:question%(I%)=1:wrong%(I%)
=0:NEXT
  770 pl%=0:RESTORE1230:REPE
AT REPEAT pl%=pl%+1:IFpl%>pl
ayers% pl%=1
  780 UNTILMID$(finished$,pl
%,1)="0"
  790 VDU28,0,31,19,4,12,26:
COLOUR1:PRINTTAB(0,4);name$(
pl%);:COLOUR2:PRINTTAB(20-LE
N(STR$score%(pl%)),4);STR$sc
ore%(pl%)
  800 PROCmake_array(level%(
pl%)):PROCprint(level%(pl%))
:PROCanswer(level%(pl%)):UNT
ILINSTR(finished$,"0")=0 OR
escape%:ENDPROC
  810 DEF PROCanswer(l%) *fx
21
  820 pitch%=l%*4-wrong%(pl%
)*4:FORI%=1TO6:PROCtune:answ
er%(I%)=0:answer$(I%)="":NEX
T:arrow%=1:upto%=0:PROCarrow
s(l%,arrow%):TIME=0:REPEAT P
ROCtune:key%=INKEY(1)
  830 IFkey%=32PROCarrows(l%
,arrow%):REPEAT arrow%=arrow
%+1:IFarrow%>(l%-1)DIV2+2 ar
row%=1
  840 IFkey%=32 UNTILNOTansw
er%(arrow%):PROCarrows(l%,ar
row%)
  850 IFkey%=ASC"T"sound%=NO
Tsound%:*fx15
  860 IFkey%=13PROCreturn
  870 IFkey%=10ANDlevel%(pl%
)<10level%(pl%)=level%(pl%)+
1:question%(pl%)=1:pl%=pl%-1
:jump%=-1ELSEjump%=0
  880 IFkey%=27escape%=-1ELS
Eescape%=0
  890 UNTILjump% OR upto%=(l
%-1)DIV2+2 OR TIME>5000 OR e
scape%:IFjump%ORescape% ENDP
ROC
  900 PROCarrows(l%,arrow%):
IFTIME>5000 VDU28,0,31,19,26
,12,26,17,3,31,2,27:PROCbig(
"Time out!"):PROCwrong:ENDPR
OC
  910 check%=-1:FORI%=2TO(l%
-1)DIV2+2:IFanswer$(I%)<answ
er$(I%-1)check%=0
  920 NEXT:IFcheck%PROCright
 ELSE PROCwrong
  930 ENDPROC
  940 DEF PROCarrows(i%,j%)
I%=pos%((i%-1)/2+1,j%):x=(I%
-1)MOD3*12+1:y=(I%-1)DIV3*5+
8:PROCsprite(right,&5803+y*&
140+x*8):x=x+10:PROCsprite(l
eft,&5803+y*&140+x*8):ENDPRO
C
  950 DEF PROCreturn IFanswe
r%(arrow%) ENDPROC ELSE upto
%=upto%+1:COLOUR3:PRINTTAB(3
,25+upto%);word$(arrow%);:an
swer%(arrow%)=-1:answer$(upt
o%)=word$(arrow%)
  960 ENDPROC
  970 DEF PROCright PROCtick
:question%(pl%)=question%(pl
%)+1:IFquestion%(pl%)>3quest
ion%(pl%)=1:level(pl%)=leve
l%(pl%)+1:IFlevel%(pl%)>10 f
inished$=LEFT$(finished$,pl%
-1)+"1"+MID$(finished$,pl%+1
,LENfinished$)
  980 PROCwait(15):score%(pl
%)=score%(pl%)+100-(TIME DIV
100)*2:a%=score%(pl%) DIV10:
b%=score%(pl%) MOD10:IFb%>=5
a%=a%+1
  990 score%(pl%)=a%*10:PROC
wait(10):ENDPROC
 1000 DEF PROCwrong PROCcros
s:PROCwait(15):PROCcross:wro
ng%(pl%)=wrong%(pl%)+1:IFwro
ng%(pl%)>=3 finished$=LEFT$(
finished$,pl%-1)+"2"+MID$(fi
nished$,pl%+1,LENfinished$)
 1010 ENDPROC
 1020 DEF PROCwords RESTORE1
300:a%=0:REPEAT a%=a%+1:READ
words$(a%):UNTILLEFT$(words$
(a%),3)="END":max%=a%-1:ENDP
ROC
 1030 DEF PROCmake_array(l%)
 IFl%MOD2=1 FORI%=1TO(l%-1)/
2+2:word$(I%)=words$(RND(max
%)):NEXT:ENDPROC
 1040 word$(1)=words$(RND(ma
x%)):FORI%=2TO(l%-1)/2+2:PRO
Ctune:REPEAT word$(I%)=words
$(RND(max%)):UNTILLEFT$(word
$(I%),1)=LEFT$(word$(1),1) A
```


```
ND word$(I%)<>word$(I%-1):NE
XT:ENDPROC
 1050 DEF PROCprint(l%) FORI
ions%=1TO(l%-1)/2+2:PROClion
(l%,lions%,word$(lions%)):NE
XT:ENDPROC
 1060 DEF PROClion(i%,j%,w$)
 I%=pos%((i%-1)/2+1,j%):x=(I
%-1)MOD3*6+2:y=(I%-1)DIV3*5+
6:PROCsprite(lion,22214+y*&1
40+x*16):COLOUR3:PRINTTAB(x+
2-((LENw$+1)DIV2),y+7);w$:EN
DPROC
 1070 DEF PROCdisplay VDU22,
5:PROCcol(6,3):VDU12,17,129,
17,2:PRINTSTRING$(60,CHR$140
```

```
):VDU5,18,0,0:MOVE200,1000:P
ROCbig("Roaring Scores")
 1080 VDU4,17,128:FORI%=1TO1
0:VDU17,2,31,0,4+I%*2:PRINTh
i$(I%,1);:VDU17,3,31,20-LENh
i$(I%,2),4+I%*2:PRINThi$(I%,
2):NEXT:VDU17,1,31,3,31:PRIN
T"Press SPACE BAR";:ENDPROC
 1090 REM Lion
 1100 DATA 8,56
 1110 DATA -1,11,0,16,1,16,1
,-1,5,0,48,48,112,80,64,64,9
6,50,36,112,37,66,5,80,5,18,
32,-1,14,0,16,17,-1,7,0,1,18
,37,82,165,90,165,90,165,123
,226,106,49,112,112,240,210,
240,180,240,97,112,225,218,2
25,218,165
 1120 DATA 90,180,90,180,56,
-1,5,48,16,18,18,33,48,48,11
2,112,112,225,218,180,124,24
8,0,0,64,37,90,165,90,165,90
,165,90,165,120,180,121,241,
243,226,230,247,247,240,240,
225,90,165,90,165,90,180,120
,240,120
 1130 DATA -1,10,240,180,240
,180,120,180,240,120,240,240
,240,224,224,128,-1,4,0,16,1
61,90,165,90,165,90,165,210,
240,252,254,254,118,252,248,
240,225,240,225,90,165,90,16
5,210,180,120,-1,14,240,180,
240,180
 1140 DATA 240,180,90,33,16,
48,114,116,0,0,16,37,90,165,
90,165,90,165,240,240,240,22
5,90,165,90,165,90,165,90,16
5,90,165,74,164,72,4,-1,4,0,
-1,9,128,192,192,224,240,240
,240,210,180,240,180,120,210
,240,240
 1150 DATA 240,0,0,8,0,72,16
5,90,165,90,165,90,164,74,16
5,90,165,90,165,90,165,74,16
4,72,132,72,128,-1,14,0,16,1
6,97,-1,7,240,224,192,12,128
```

Tania

```
,128,-1,6,0,128,72,132,74,16
0,10,128,0,0,0,128,8,128,0,1
6,48,48
 1160 DATA 112,112,112,240,-
1,4,224,96,-1,6,112,224,224,
164,192,72,132,72,72,-1,4,12
8,-1,17,0,64,4,88,133,90,165
,74,164,194,132,192,128,-1,3
5,0,-9
 1170 REM Left arrow
 1180 DATA 3,24
 1190 DATA -1,9,0,17,17,51,5
0,118,50,51,17,17,-1,9,0,34,
34,102,102,238,234,234,234,2
43,240,240,240,243,234,234,2
34,238,102,102,34,34,-1,11,0
,238,243,241,243,238,-1,8,0,
-9
 1200 REM Right arrow
 1210 DATA 3,24
 1220 DATA -1,11,0,119,252,2
48,252,119,-1,11,0,68,68,102
,102,119,117,117,116,252,240
,240,240,252,116,117,117,119
,102,102,68,68,-1,9,0,136,13
6,204,196,230,196,204,136,13
6,-1,6,0,-9
 1230 REM Tune data
 1240 DATA52,52,0,52,52,0,52
,0,52,68,0,68,80,80,80,0,80,
68,52,52,52,60,60,60,0,60,0,
60,0,60,60,60,48,48,48,0,60,
48,32,32,32,52,52,0,52,52,0,
52,0,52,68,0,68,80,80,80,0,8
0,68,52,52,52,60,60,0,60,60,
32,40,48,48,52,52,52,52,0,52
,52,0,0,0,0,0,0,0
 1250 DATA-9
 1260 DEF PROCtune READp%:IF
p%=-9RESTORE1240:READp%:IFup
ing% pitch%=pitch%+4:IFpitch
%>36pitch%=0
 1270 IFp%=0SOUND1,0,0,1ELSE
IFsound% SOUND1,-6,p%+50+pit
ch%,3ELSESOUND1,0,0,3
 1280 ENDPROC
 1290 REM Name data
 1300 DATA Cleo,Leo,Bill,Bob
,Suzi,Jack, Jill,Jake,Bob,Ja
ne,Hans,Anne,Abel,John,Mike,
Avis,Andy,Burt,Bret,Carl,Cut
y,Brad,Ross,Rob,Joe,Ron,Jock
,Dick,Fred,Kate,Jim,Zoe,Pete
,Sam,Ben,Rick,Joan,Anna,Sara
,Nik,Tim,Pat,Phil,Dave,Matt,
Len,Wal,Hank
 1310 DATA Tom,Evan,Kim,Jose
,Zico,Tony,Paul,Mark,Russ,Gu
s,Jen,Ella,Liz,Emma,Jodi,Kat
h,Paws,Tigs,Rolf,Ralf,Rana,T
odd,Lisa,Judi,Lyn,Mary,Marg,
Mink,Alli
 1320 DATA Phill,Katie,Steve
,Craig,David,Timmy,Nicky,Car
lo,Harry,Billy,Jamie,Dean,Ni
col,Derek,Peter,Chris,Sarah,
Brent,Brett,Heath,Jimmy,Keit
h,Kerry,Franz,James,Penny,Je
nny,Shane,Susan,Ruth,Grant,G
arry,Kylie,Mitch,Miles,Davis
,Piper,Elton,Ken
 1330 DATA Fran,Trudy,Shena,
Kaye,Fiona,Tania,Sofie,Kelly
,Sven,Kama,Denis,Terry,Terri
,Nikki,Simon,Jason,Frank,Rob
yn,Robin,Olive,Lynne,Sandy,H
elen,Miria,Megan,Karen,Lewis
,Cassy,Perry,Marc,Wayne,Will
y,Zane,Will,END
```

Adventures by Pendragon

New adventures are on the way

TWO new adventures have appeared on my table this month and both deserve a mention before I sit down to the enjoyable task of reviewing them.

First to arrive was the new Elk Adventure Club release entitled Axe of Kolt. As with Larry Horsefield's previous two escapades with The Quill, this adventure has to be loaded in a number of parts.

However, there the similarity to Magnetic Moon and Starship Quest ends. Axe of Kolt is a mini epic of Middle Earth fantasy, and as such is a world away – pardon the pun – from his two science fiction classics.

The Axe of Kolt is a magical weapon forged more than 200 years ago by Magor the sorceror. The hero, Kolt, had wielded it when he vanquished the Xixon – an evil race of reptilian men who invaded the kingdom of Hectate.

Now the axe is needed again, as the Xixon have returned to wreak their revenge. The axe was buried along with Kolt when he died, and the location of his tomb has long been forgotten.

Your task soon becomes apparent as you set out on your journey to recover the axe. This adventure is not quite in the Robico league, but at only £5.95 it should not be missed by any discerning buyer.

The second goody to be dropped in the courtyard was the much awaited sequel to Suds, titled strangely enough, American Suds.

This is another four part adventure which pokes fun quite cleverly at American soaps.

The experience begins with a plane journey which parodies the classic film,

Readers' Hall of Fame

Rick Hanson – *Robert Hales*

Here is the final sequence needed to complete this adventure which was unfortunately omitted from the September 1987 issue of *Electron User*:

Return to the top of the ladder and go E, E, N, N, E, E, S. To open the door in the alcove, type in the numbers from the church. Open the next door with the screwdriver. Kill Garantz with the razor – don't use the gun. Victory is yours!

Enthar Seven – *The Boss* (continued from last month)

We now begin the final phases of this eternal quest. Equip yourself with the oar, Y shaped twig, vial of poison, flask filled with water from the washroom, fan and pair of pliers. You should now teleport to sector five, the desert.

Carefully divine your way through the desert taking care not to make one mistake. The fan and flask are simply insurances against making such a mistake in this arid maze. You will soon descend a flight of steps which lead to a river bank.

Hide in the hedge from the hunters in the canoe. While in hiding, you will discover a teleport bracelet which should be worn for the remainder of the game. If you remember the instructions contained in the manual you found earlier in sector two, you will be able to put the bracelet to good use.

Once the hunters have disembarked you can steal their canoe and paddle it through the rapids. When you crash land you must remember to gather all your belongings together and replace the bracelet on your wrist.

Journeying North East in the swamp will lead to a ramshackle hut which has a padlocked door. The pliers can be used judiciously to cut the chain. Inside the hut you will discover a muffler which will prove invaluable in the final stage of this adventure.

A trek South East in the swamp will lead to a carnivorous plant which must be poisoned. You may then surmount the steps which lead to the teleport chamber.

Next month, our year-long solution comes to its end.

Village of Lost Souls – *Peter Youde*

Leave the ring of stones and deal with the thieving dogs. E, NE, IN, UP, GET HAMS, DOWN, OUT, DROP HAMS. Collect the bow and arrow to kill the thieving bird. SW, E, N, IN, IN, GET ARROW, OUT, OUT, SW, S, E, SW, S, SW, GET BOW.

Get the chalice from the nettles by the river and when bird appears, fire the arrow then drop the bow. NE, N, SE, N, N, N, IN, IN, E, N, N, E, GET CHALICE. Go and fill the chalice from the church font. W, S, S, W, OUT, OUT, SW, S, SE, IN, FILL CHALICE WITH WATER. Use the water to

Airplane. You then have to deal with the mega-stars of Dallas and Dynasty and the assorted rag-bag of American cops.

Captain Gorilla of the Kill Street precinct may pose an explosive problem.

A classic puzzle is how to get rid of the mice in the mansion in part three of this adventure. The answer is simple, but excruciating.

Just get the flute from the music room, go to the kitchen and give it to the German chef who is polishing a pie. The pie wiper from Hamelin will then get rid of the mice for you!

If you can suffer a pun as bad as that, the humour in this adventure will have you falling off your chair. At only £4, American Suds simply cannot be missed.

Further news on the Topologika front is equally good. The company is offering its disc-based adventures at the following discounts: One adventure at £9.95, two at £15, three at £20 and four at £22. I suggest that 5.25in disc drive owners start saving their pennies now.

An excellent new educa-

Turn to Page 44 ►

Problems Solved

Michelle Hurds, Ann and Peter Youde, Tom Johnstone and Bob Purder are stuck at various points in Riverdale's howler, **Suds**.

Michelle should stone the crow and use the Yorkshire pudding to cross the lake in part one of the adventure. Ann and Peter must erase the Equity card in the Abdication Street section. Tom would be wise to wear the chamber pot at the Cross Eyes Motel.

Bob should pray to keep the vicar happy at Emeroyd Farm. In the Dead Enders section of Suds he must give Mrs Favour a curry in order to curry favour.

Sarah Smart of Hinckley cannot get into the spaceship in Superior's **Stranded**. I think you must GO AIRLOCK and PICK LOCK to achieve this, Sarah.

Daniel Lippet must drop a treasure and say STEAL (whichever treasure was dropped) to get out of the desert in Micropower's **Adventure**.

He should also avoid the Valley of the Shadow of Death in Kansas City's **Ferryman Awaits**. Have you seen the special I did on this adventure in the March 1987 issue of *Electron User*?

In Robico's special 64k version of **Island of Xaan**, Michael Williams and John Townley must persevere if they wish to break free of the chains.

Finally in **The Hunt**, Andrew Learmouth must find a way to foil the lasers if he is to travel in safety along the East-West corridor near the market. This is one adventure where I found that drawing a map was essential to survival and progress.

put out the burning hut. OUT, N, N, SW, E, THROW WATER. Enter the hut to find that a field must be ploughed, then start collecting the parts of the plough. IN, OUT, W, GET SHARE, NE, S, E, SW, S, SW, E.

Take the plough to the smithy for repairs. GET PLOUGH, W, NE, N, SE, NE, E, SW. Leave the plough and share here and go and get something to light the forge with and the tools to repair the plough.

DROP PLOUGH AND SHARE, NE, NW, SW, N, N, NW, W, S, S, S, S, SW, SW, GET STAFF, NE, NE, N, N, N, NE, E, E, S, NW, IN, GET BELLOWS, OUT, SE, E, NE, E, SW, IN, IN, GET HAMMER, OUT, OUT.

Attach the bellows to the forge then light it. ATTACH BELLOWS TO FORGE, WAVE STAFF, LIGHT FORGE. Fix the plough then find something to pull it.

REPAIR PLOUGH, NE, NW, SW, W, IN, NE, UP, UP, UP, GET YOKE, DOWN, DOWN, DOWN, SW, OUT, E, NE, E, E, N, W, S, GET REINS, N, E, HARNESS OXEN.

Philosopher's Quest – *John Tipper*
(continued from last month)

Go down and map the M.E. passages until you find the workman. Return to Piccadilly Circus, picking up the portrait on the way. Go West, drop everything you are carrying and go West again. When you cease to exist think, then move East.

Collect your belongings and return West. Go West again and retrieve the ancient book by Socrates. Now go to the shop and drop any treasure you are carrying. Assuming you have the matches and bottle of ink, go to the beach, go West, get the driftwood, return East and venture South into the sea. Swim downwards until you reach the seabed, then swim South until you reach the wreck.

Enter the wreck South East, open the cupboard, enter and get the slipper, leave and return to the entrance to the wreck. Go South West into the dank corridor, find the octopus and drop the bottle of ink. When the octopus swims away get the chest and leave.

Once outside the wreck go North and allow yourself to be swallowed by the whale. To escape from its belly you must light a match and travel in the opposite direction to the drift of smoke until you reach the gold tooth.

Light a match once more and set fire to the driftwood, GET the TOOTH before you are coughed out of the whale's mouth.

Go to mid-depth for every five moves you make in deep water and spend one move at this depth. Swim to just below the surface and then East until you reach the beach.

Return to the shop with the last bits of treasure and you will have scored 249 points. To gain the extra point simply say BLACH!

This solution is for the Acornsoft version of this adventure. It will not prove successful with the new enhanced Topologika version.

Adventurer's Glossary (continued from last month)

Gas: You will need to wear some kind of protection against it.

Gem: Surely a treasure.

Ghost: Can be helpful or dangerous.

Giant: Usually friendly, and can be helpful for carrying heavy loads.

Gladiator: You will need to fight and defeat him.

Gloves: Wear them when handling anything which might be dangerous.

Gold: Can be as a bar or in a bag, but nearly always a valuable treasure or part of a monetary system.

Grill: You will need to open it or saw through it.

Guard: He must be bribed or paid. If not, you will need to find some other way past him.

Gun: Might need a silver bullet if it's a werewolf that you are hunting.

◄ *From Page 43*

tional disc based adventure from Topologika is Giant Killer. It costs a pricy £18, but is a superb aid to teaching maths to 10 to 14 year olds.

In response to my challenge to readers to complete Sphinx Adventure in the minimum number of moves, I have received some intriguing replies.

Jane Forbes sent in a fantastic theoretical solution which would enable an adventurer to complete the game in only 253 moves. But honours have to go to Quillaquest who has dissected the adventure and provided a 14 page solution.

It provides two routes which will conclude the game in 229 or 195 moves involving an ingenious cheat. The crux to Quillaquest's thesis involves the pirate and the water bottle which need careful experimentation to enable the cheat.

I cannot possibly reproduce all of this magnum opus, but am now able to answer almost any question you care to pose about Sphinx Adventure. A suitable prize is now winging its way to this anonymous character.

Until the cheats don't prosper, happy adventuring!

electron user

TWIN KINGDOM VALLEY

Underground (Map 4)

SLOPING MAZE SHORTEST ROUTES

Mountain cave → Maze → Maze → Maze → Maze → Maze → Maze → Maze → Cave → River of gold Secret of life (Rock fall) → Maze → Maze Holdall → Maze → Cave Diamond (Secret) → Fissure → Canyon

Cave Diamond → Bedroom → Kitchen Gold key → Sitting room (Secret) → Dry passage → Wet passage → Musty passage → Trail → Cave Passage (Brass) → Hall of Forest King Amulet Silver key → Shaft → Strongroom Gold (Secret Silver) → Bone room

Cave Passage → Shaft → Chamber Dagger → Twisting Maze → Witch Bronze key

Dry passage (Gold) → Room → Short passage (Bronze) → Dungeon Princess

Room → Damp hal (Bronze) → Dungeon Ill giant

Damp hal → Ante room (Castle)

Musty passage → Passage Rod → Room Dagger (Bronze) → Landing → Stairs Ring → Chamber Gold

Room Dagger → Room Ball → Passage → Clearing

Next month's map will feature the Castle. Maps 1 and 2 (South of the Canyon) and 3 (North of the Canyon) can be found in the February, March and April issues.

TWISTING MAZE – SHORTEST ROUTES

Passage → S → N → E → W → Witch → E → E → S → N → Passage

Bone room → S → W → S → E → Witch → W → W → W → S → Bone room

Quest

TONY OAKDEN reveals the problems he found writing the arcade game we review on Page 16

QUEST is a large arcade adventure I began programming about 18 months ago. It features a young lad called Walter Cobra who goes in search of the mysterious Golden Dragon.

Most games of this type tend to use either Mode 2 or Mode 5. I wanted Quest to be different from others on the market, so Mode 1 was used.

This gives very fine detail, but unfortunately is limited to four colours. However some pretty effects are possible by dithering.

This is a technique where alternate pixels are plotted in different colours. Due to the low resolution of most monitors and TV sets they run together to give another colour.

The palette was switched between screens to brighten up the game even more.

The BBC Micro version uses interrupts to keep the colours at the top of the screen constant, but despite trying several techniques this could not be achieved on the Electron.

This interrupt, and the hash at the top and bottom of the screen, are the only differences between the two versions.

Electron users might be interested to know that the game was just as difficult to fit into a BBC Micro as it was into the Electron.

There are many different types of animal in Quest. Each has a different appearance, and in addition they also have individual characterics and behaviour patterns.

This posed problems due to the limited amount of memory available, so certain routines had to be shared by different sprites.

Take the small robots which bounce off the walls: They use the same collision detection routine as the man, but because they are smaller the routine needs different parameters. This worked very well – except that they also bounced off the man. To solve this problem a method was needed to make them attack if they were touched.

The game already contained a proximity detection routine, used by the bats to detect the man if he got closer than about 10 pixels. The robots use the same routine, but again, they use different parameters.

One feature peculiar to Quest is the ability of certain animals to move freely between screens – ghosts and robots both move on and off screens.

The robots always start at the same place when you enter a screen, but they will sometimes come on to a screen while you are trying to negotiate an obstacle.

The ghosts will follow you between screens and are quite intelligent.

The idea is to try to tie the action on different screens together, giving the feel of a complete game rather than a series of individual screens.

All animation is controlled via a series of flags and parameter blocks. When a new screen is drawn, all the flags are cleared and if a particular animal is needed a flag is set and the corresponding parameter block initialised.

The structure of the animation routine is very simple:

- The keyboard is scanned.
- The man is moved accordingly.
- Any other animated characters are moved.
- Has the man reached the edge of the screen? If he has, draw the next screen.
- Has he run out of energy? If so, end the game.
- Loop back to the start.

Because there is more action on some screens than others, a method was required to run the animation at a set speed. I eventually did this by resetting TIME to zero at the beginning of the animation loop and then checking to see if it was less than eight at the end.

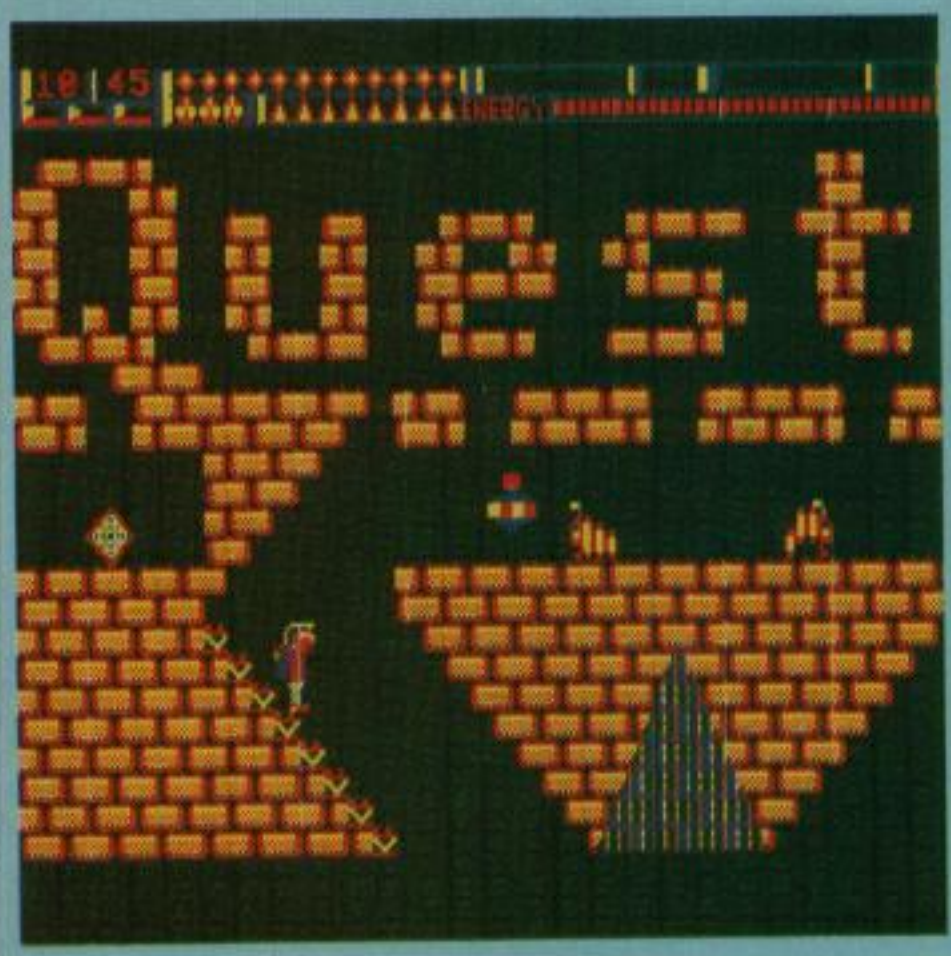
If it is, the program waits until TIME is greater than eight. The Basic equivalent is:

```
TIME=0
 (animation loop)
REPEAT
UNTIL TIME >8
```

This locks the animation at a maximum of one frame every 0.08 sec, or 12 frames per second. By varying the time limit, different effects are possible – that is how the Time Warp feature was created.

The resultant game is, I hope, a good blend of well animated characters and interesting patterns. However, the code is a nightmare of nested loops and subroutines.

A good analogy would be a swan, which from the bank



The first screen of the game

appears to glide gracefully along, but under the water has huge ugly paddles frantically churning away!

The map, is made up from an 8 by 10 grid of screens. The address of the data for each screen can therefore be calculated, eliminating the need for a look-up table.

This made designing the game very difficult, as each section of the map has to connect and the puzzles had to be spread out, with many challenging animated problems in between.

Each screen is built up from 15 blocks on a five by three grid. This is a rather coarse way of doing the job, but by using one byte per block 256 possible shapes are available. For example, block number two is a solid square, while 17 is the elephant.

In fact only numbers 0 to 63 are defined, 64 to 127 use the same data as 0 to 63, but are inverted. Numbers 128 to 255 use the character set.

By having two passages in one block it was possible to build some very complex mazes. If you play the game on a standard size monitor there is something like 50 feet of passages in the ghost maze alone.

Each block is built up from an eight by eight grid of characters. These are the smallest element, and consist of things like the bricks, leaves and metalwork.

Again there is a total of 256 possible characters, but only the first 64 are defined as data. The next 64 are inverted, and by EORing the character with a striped mask additional shapes became possible.

Some of the objects in the game, such as the key handles and cross, are also used to create interesting effects.

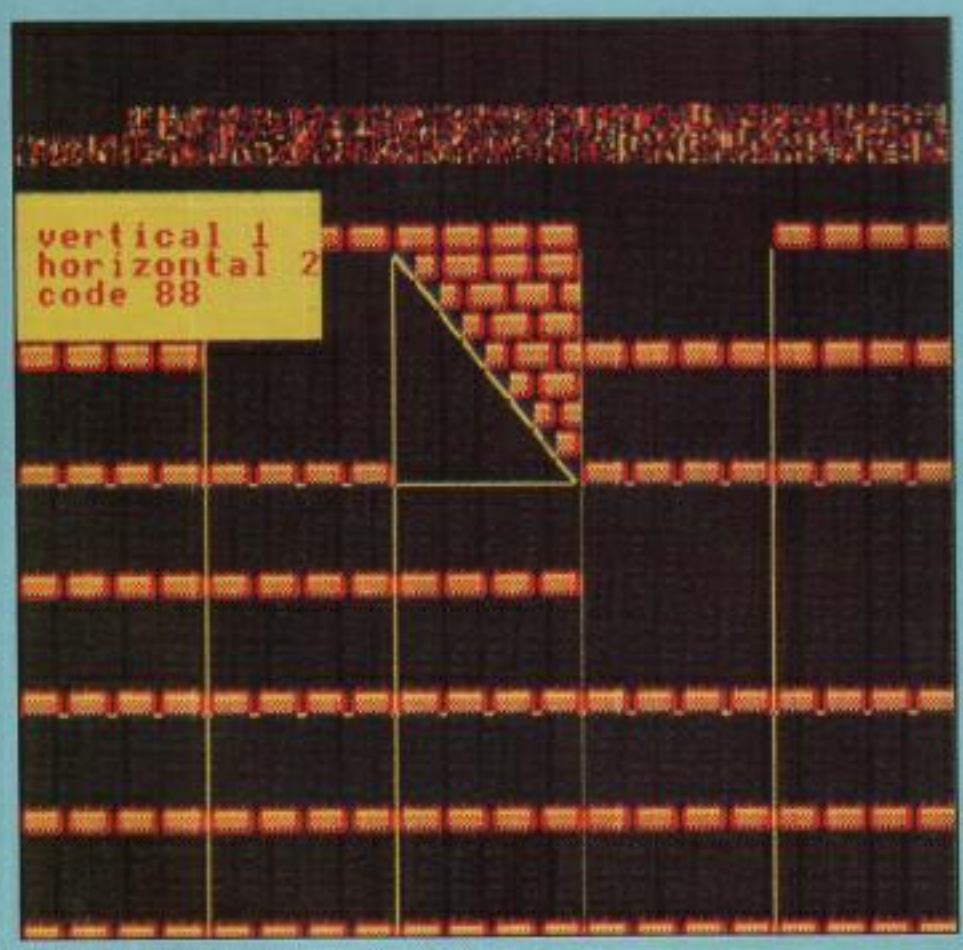
Finally, the operating system routine for drawing triangles was incorporated, but an undefined graphics number was used to obtain the striped effect.

A small utility was needed to design all the shapes and sprites used in the game. There did not seem to be any suitable commercial packages available, so an editor was written in Basic.

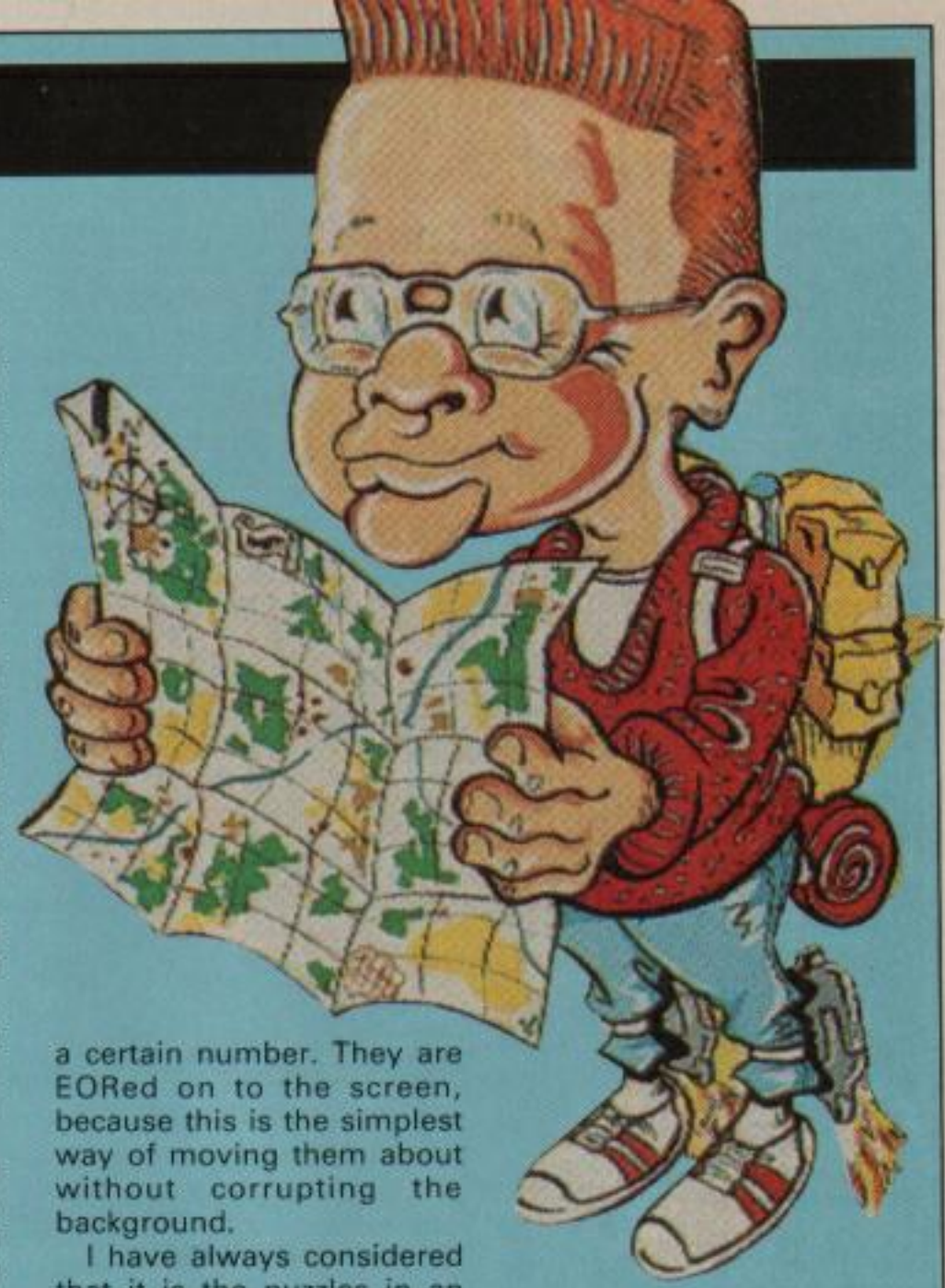
The sprites and other objects were initially designed on paper and then modified. I was particularly pleased with the caterpillars and ghosts.

As the sprites are printed on the screen a routine was included which doubled their height, allowing the display of nice big sprites.

Unfortunately, the Electron is not fast enough to draw a lot of large sprites in Mode 1, so they are automatically drawn at normal height if there are more than



The screen editor



a certain number. They are EORed on to the screen, because this is the simplest way of moving them about without corrupting the background.

I have always considered that it is the puzzles in an adventure which make the game interesting.

Quest was to have as much variety as possible. I particularly wanted to avoid the situation where every puzzle is solved by simply taking the appropriate object to the correct place.

Wherever possible extra animation was included when a puzzle was solved. A good example is the elephant, which has to be moved to get into the next section of the game.

I wanted the elephant to actually move out of the way rather than simply disappear.

The sprite animation routine could not be used because of the beast's size and the way the data is stored. So a fast software scroll was used to actually move each byte of the elephant in turn, one byte to the right.

This worked very well and the same routine was used with several other objects.

Another puzzle I was keen to include was a time-related one. To do this a real-time clock was needed. It runs independently of the game and uses the interval timer crossing zero event to generate an interrupt every 60 seconds.

The routine works by resetting the interval timer to –6000. It is incremented by the operating system every 0.01sec, independently of the game.

As it crosses zero an interrupt is generated which passes control to an interrupt routine which resets the timer to –6000 and increments the clock. Control is then passed back to the main program.

Several objects in the game have to be used correctly. The program allows them to be dropped and picked up again at almost any point.

This was quite tricky and meant having to keep track of their position and also make sure they were dropped in a sensible place – not floating in water or in mid-air.

This meant I had more scope for problems involving lateral thinking. I also had a lot of headaches trying to make sure the player could not get into areas of the game by using objects in a way I had not expected.

Eight passwords have to

Turn to Page 48 ▶

The sprite designer

◀ *From Page 47*

be found to log on to the terminals. I had a lot of fun deciding what these terminals should do – and I think some will bring a few surprises.

My favourite puzzle is the music room. This is, I believe, the first musical puzzle ever included in an Electron arcade adventure.

To get the organ to play a true scale was rather difficult. The pitch of each note is stored as data and as the man moves over the keys his position is used to calculate which note is played.

Most of the sounds use envelopes, and a small editor was used to define them. This made it easier to get some quite interesting effects. However, the sounds are, by necessity, very simple and I hope unobtrusive.

I have played Quest all the way through on several occasions and can finish it with the game clock showing 12.06 – about 1 hour 10 minutes real time.

There is plenty of energy available in the game, and providing you stop and think, all the screens can be negotiated without losing too much.

The underwater section is perhaps the hardest, as there is a severe time limit. The secret is to put your head up in the air pockets as often as possible.

The game was programmed on an Acorn Electron with Plus 1 and Plus 3 expansions. With the Plus 3 active the amount of free memory is very limited, so I used ACP's sideways ram and E00 DFS to get PAGE back to E00.

The whole system was generally very reliable, but I did find one or two minor bugs. Trying to save files to disc in Modes 0 to 2 sometimes resulted in disc errors. This could be due to the reduced speed of the system.

Some data is stored in the screen memory and I had to save in these modes. To get around that I used a technique I saw in *Electron User*, where the operating system is temporarily forced into Mode 6 to increase the processor speed.

I also used this technique to speed up the machine while it is drawing the screens.

When developing a game like this, the source code has to be loaded, modified, assembled and the resulting object code saved back to disc.

The modified source code then has to be saved and the new object code reloaded with the rest of the game in order to test it.

If there are any problems – and you can bet your disc drive there will be – the source code has to be reloaded and the whole operation repeated.

On a bad night I would do this perhaps 100 times, so cassette tapes would be completely useless, and the discs and drive had to be as reliable as possible.

One important lesson I learned while working on Quest was always to keep at least two backup copies of the game. I would also recommend using good quality discs for the main backup at least. I also try to rotate them to avoid over working one disc.

On the BBC Micro Mode 7 can be used for assembling machine code. This leaves about 28k of ram for the source and machine code.

On the Electron, Mode 6 must be used instead, which reduces the amount of ram available.

One dodge to get round this is to assemble the code into the screen memory. Set O% to &6000, P% to the start address of the machine code and use OPT 4 to 7.

You can see the machine code being built up on the screen, and it leaves extra space in the program area for the assembler text. But remember to turn off the cursor.

Quest is my first serious game, and I must admit it nearly drove me to the point of despair. At one stage last year I decided to give up altogether and sell my computer in order to buy an Amiga.

I actually placed the adverts, but then changed my mind and decided to press on and see what happened.

I sent the game to Superior Software just after Christmas and they immediately wrote back to me. Since then I have worked solidly on it every night to get it debugged and versions finished for the other machines in the Acorn range. Superior lent me a BBC B, and were most helpful with suggestions and advice.

I aim to stay with the Electron for a few more games at least. I feel the machine still has a lot of potential and is only now being programmed to its limits.

I am already planning the sequel to Quest and hope to have it finished later in the year.

I have worked out a way to cram even more into the micro and have devised some devious puzzles to keep Walter amused.

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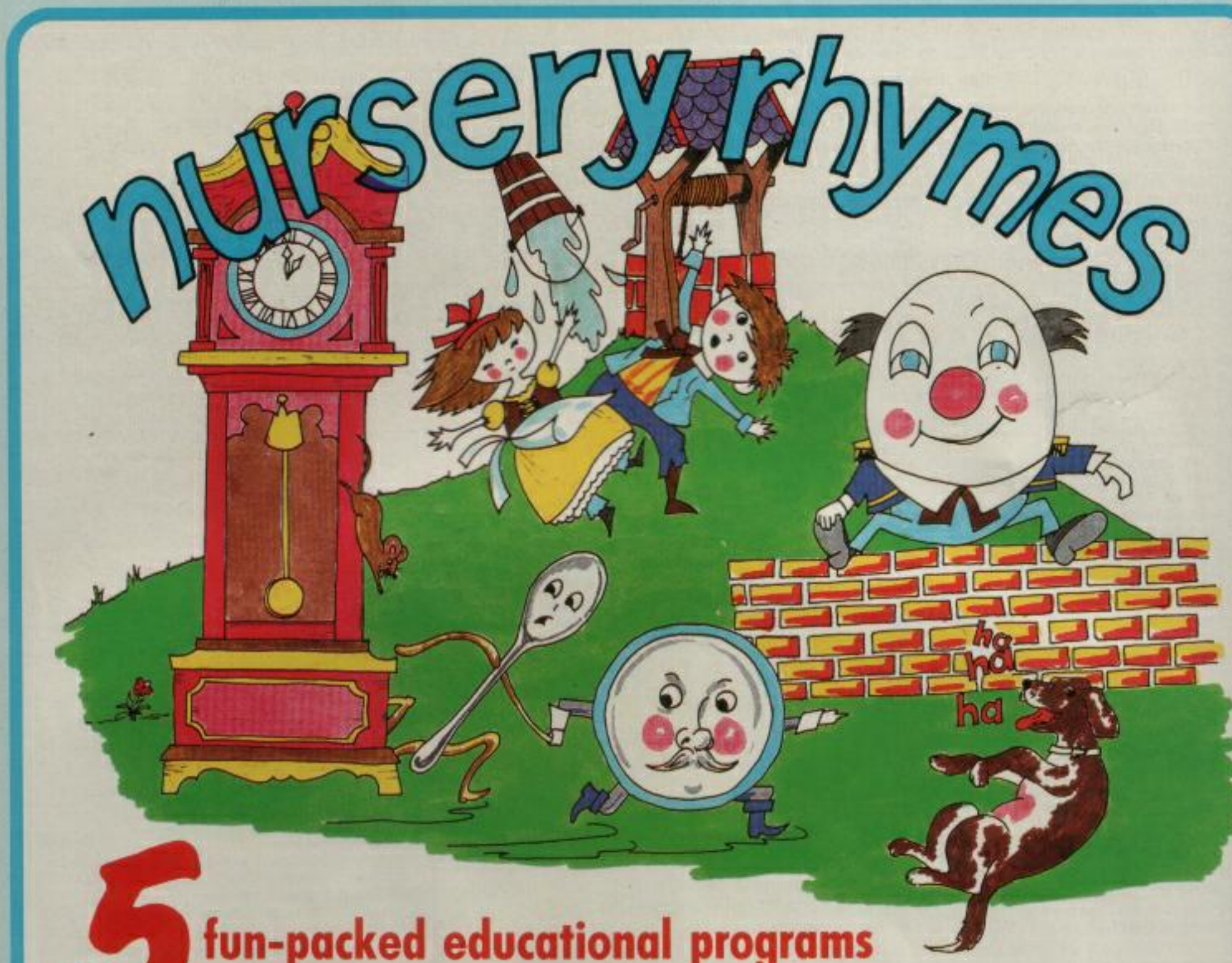

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If different parts of the screen can be made to generate a particular frequency of interference fringing, the optic nerve has no choice but to perceive that part of the screen as a colour.

The secret lies inside the Electron's ULA chip. Frame flyback occurs 50 times a second and it is possible to alter the palette for certain colours at every pass using a set sequence – thereby producing subliminal interference patterns.

These, if properly adjusted, can reproduce all eight colours – albeit rather faint and shakily – on a black and white TV.

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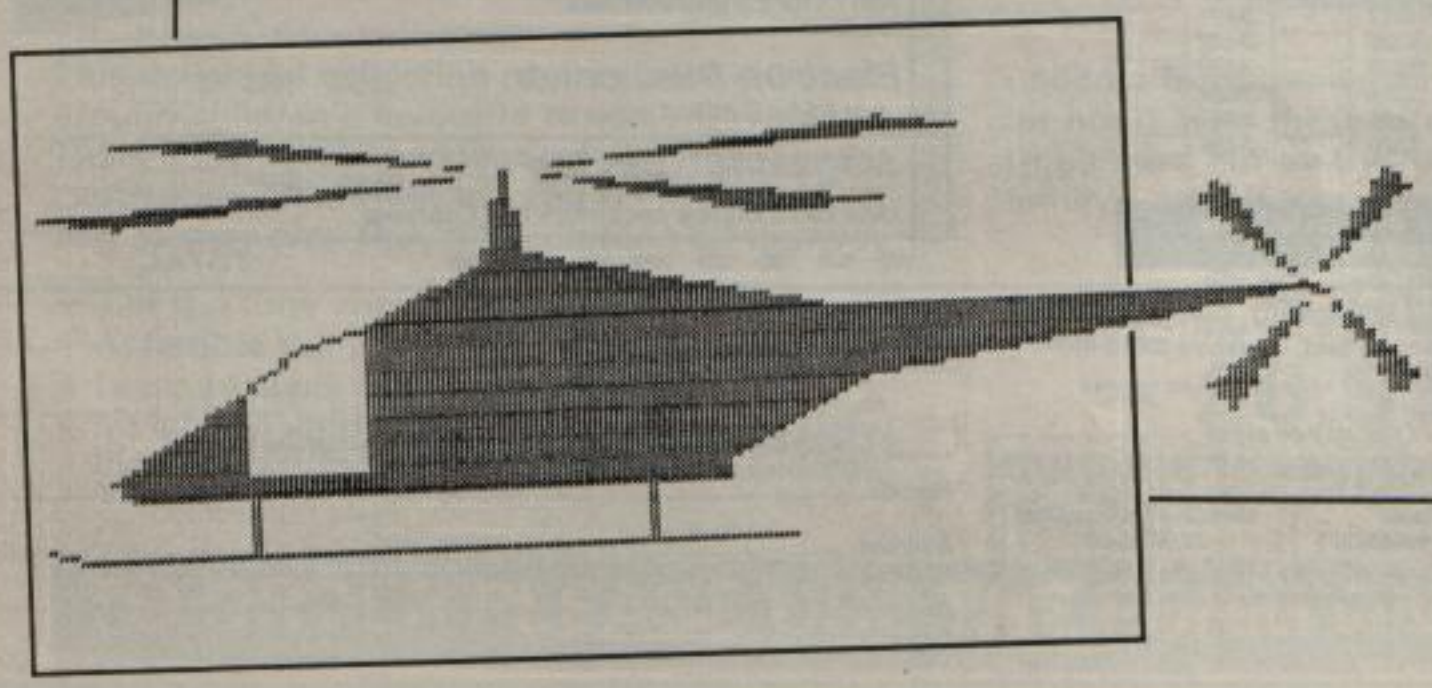
   20 B%=&900:FORY%=0TO7:REA
DA$:FORL%=0TO23:?B%=EVAL("&"
+MID$(A$,L%*2+1,2)):B%=B%+1:
NEXT:NEXT
   30 DATA A9878550A90985512
07009203F09A9328DBD09A9A9855
0A9
   40 DATA 098551A91120EEFFA
DBD092901AABDBE0920EEFF20700
9CE
   50 DATA BD0910E7A91420EEF
F20E7FF4CE7FFA9028DBD09A9808
550
   60 DATA A9098551ADBD09A00
191502070090CEBD0910F1A0C8A20
0EA
   70 DATA EACAD0FB88D0F620E
7FF20E7FF20E7FFA000B150C92AF
007
   80 DATA 20E3FFC84C7209601
3000000000002A16011700 0A20000
000
   90 DATA 0000053796E63687
26F6E6973696E6720554C41202E2
E2E
  100 DATA 2A484120484121204
17072696C20466F6F6C21202A000
102
```

HELICOPTER

```
   1 REM Helicopter
   2 REM By A M Waite
   3 REM (c) Electron User
   4 MODE 2:VDU 23,1,0;0;0;
0;19,15,1;0;:A%=0:PROCprint(
440,512,400,0.1):PROCprint(1
040,412,100,1):GCOL 0,15:PRO
Cheli:PROCvdu:END
   5 DEFPROCprint(X%,Y%,R%,
C):VDU 29,X%;Y%;:MOVE 0,R%*C
:FOR N=0 TO 2*PI STEP PI/24:
A%=A%+1:IF A%=13 A%=1
   6 GCOL 0,A%:MOVE 0,0:PLO
T 85,R%*SIN(N),R%*COS(N)*C:N
EXT:VDU 29,0;0;:ENDPROC
   7 DEFPROCvdu:FOR N%=1 TO
 12:VDU 19,N%,0;0;:NEXT:REPE
AT:FOR N%=1 TO 12:IF N%=1 VD
U 19,12,0;0;
   8 VDU 19,N%,1;0;:VDU 19,
N%-1,0;0;:NEXT:UNTIL FALSE:E
NDPROC
   9 DEFPROCheli:MOVE 440,5
12:MOVE 420,412:PLOT 85,460,
412:MOVE 1040,412:MOVE 340,3
12:PLOT 85,340,412:MOVE 800,
412:MOVE 600,312:PLOT 85,340
,312:MOVE 700,412:MOVE 440,4
62:PLOT 85,340,412:MOVE 340,
412:DRAW 290,400:DRAW 240,37
0
  10 MOVE 150,312:PLOT 85,2
40,312:MOVE 150,312:MOVE 160
,300:PLOT 85,600,312:PLOT 85
,600,300:MOVE 100,270:DRAW 1
20,260:DRAW 650,260:MOVE 250
,300:DRAW 250,260:MOVE 550,2
60:DRAW 550,300:ENDPROC
```



HERE is yet another excellent demonstration of palette switching techniques from A.M. Waite. A helicopter complete with whirling rotors is the finished effect, and the spinning blades are extremely realistic because they appear to have proper perspective as they turn.

There is a short wait while the main rotor and the stabiliser are drawn using all 16 colours in Mode 2. Finally the helicopter's body is drawn.

Now sit back to watch the amazing animation.

MICRO MESSAGES

The micro that outgrew Acorn

I RECENTLY spent several informative hours looking through three years of Electron User, *right from the first edition I bought in January 1985.*

It seemed quite strange in those early magazines to find names now so synonymous with the Electron to be missing – names like Slogger and Advanced Computer Products. Could there ever have been an Electron without them?

ACP first appeared in the August 1985 issue with a full-page advertisement for ADT – how things have moved on since then.

In the January 1986 issue I found my own letter to Micro Messages entitled Growing into giant oaks, a reference to the potential of what was still, at that time, a very small Acorn.

The Electron has indeed grown into a mighty oak and its growth makes for an extraordinary story.

Recently I was able to attend a small exhibition of Slogger products for the Electron at Newbury in Berkshire.

I was amazed at the number of enthusiasts who attended the exhibition and the many miles they had travelled to get there.

You would have thought a new computer had hit the market – was all this for the humble Electron?

Who would have envisaged, way back in 1983 when the first Electrons hit the shelves of the high street stores, that the machine in 1988 would not only be going strong, but still expanding – certainly not Acorn!

The November 1985 issue of Electron User *led with the headline: Electron production continues. Brian Long, the then new managing director of Acorn gave the assurance to* Electron User *that "we are not ceasing production of the Electron".*

When asked if the machine would be supported by Acorn in the foreseeable future, Brian Long replied: "Of course".

Well, Brian Long has come and gone, and taken his false promises with him. As an enthusiast said to me recently, "Who needs Acorn anyway?".

New names, with a proven dedication to the support of the Electron, have appeared. John Huddlestone of PRES, the team at Slogger and Gordon Cameron of PMS.

Later, Chris Rudge of Project Expansions and John Wilke of Jafa Systems have added their own brand of inventiveness and initiative.

With such a list of enthusiastic entrepreneurs, is it so surprising that the Electron continues to expand in such an exciting way?

We can all remember those letters and telephone calls to Acorn which on many occasions remained unanswered.

How different today when a telephone call to any of the major supporters of the Electron will usually bring an immediate response, an answer to an enquiry, but above all an enthusiasm for the machine which is infectious, presented with courtesy and often humour.

There have, however, been disappointments. We saw in the February 1986 issue of Electron User *the invitation to talk to the world through telecommunications.*

At the time the comms package available was too expensive for the majority of users, and it did not really catch on.

Some, myself included, did explore this new world of communications through Prestel, Micronet and Micro-Link, and have been sold on it ever since.

It is good to see at long last that comms packages for the Electron are becoming less expensive, thereby allowing other

Turn to Page 56 ▶

A Cautionary Tale

Young Kevin bought an Acorn
From the shop just down the road.
He knew all of the simple stuff,
Like Chain and List and Load,
But although he had a User Guide
He never thought to look inside,
So Kevin's idea of a dream
Was zapping monsters on the screen,
And moving little graphic frogs,
Manipulating graphic dogs.

He soon got sick of Hopper,
Space Invaders and that lot,
So he planned a trip to Woolworths
Just to see the stuff they'd got;
When suddenly, out of the blue
He woke up in the night,
He'd been struck by an idea;
Some new programs he would write.

So he sat down and he fiddled
'Till his brain and fingers numbed,
His back and neck were aching
And his television hummed.
After three weeks of this exercise
He'd got nowhere at all, so
He smashed up his computer;
Threw his Acorn at the wall.

So the moral of this story
(If a moral is supplied), is:
"Before you start to program
You should read the User Guide!"

– Rob Lad, Northallerton, North Yorks.

◀ From Page 55

users to access viewdata systems and bulletin boards.

Among my few disappointments is the fact that Electron User *has not included a small section in the magazine centered around this whole field.*

For although the amount of users on the systems are as yet small, I am quite sure that numbers will increase – especially if more information is given.

These points apart, as users we have much to be grateful for – not least to those magnificent men on their Electron machines, who so actively support this amazingly tenacious computer.

Thanks also to the Electron User *team, that has the privilege of bringing the news together and informing us of what is going on in the Electron world.* – **T. Dunkerley, Reading, Berkshire.**

Peripheral puzzle

I RECENTLY bought an Electron with which I am delighted. However, I didn't find the User Guide too helpful, as it gave little information on how the basic unit could be extended for using disc drives, printers and other peripherals.

Even the Advanced User Guide isn't very specific on these points.

My problem is – and I am sure other enthusiasts have experienced the same difficulty – how do I expand my system, and with what?

Your publication is excellent, but with a proliferation of suppliers advocating anything from a Plus 1 to a Rombox Plus and beyond, it is difficult to know which way to jump.

I wish to use a 5.25in single disc drive which I have acquired, but as my knowledge of computers is very limited, I would welcome any comments from you or your readers, who themselves must have been similarly perplexed when they first entered tentatively into the world of computers. – **George Lynch, Edinburgh.**

ALL programs printed in this issue are exact reproduction of listings taken from running programs which have been thoroughly tested.

However on the very rare occasions that mistakes may occur corrections will be published as a matter of urgency. Should you encounter error messages when you type in a program they will almost certainly be the result of your own typing mistakes.

Unfortunately we can no longer answer personal programming queries concerning these mistakes. Of course letters about suggested errors will be investigated without delay, but any replies found necessary will only appear in the mail pages.

● The subject of expanding an Electron is one which seems to have caused problems for a lot of readers. In the near future we hope to run a feature containing hints and guidelines for adding peripherals to an Electron, together with basic explanations of what certain products do, and why they are necessary.

For the time being however, you can find many articles in back issues of *Electron User* covering a wide range of products in some depth.

To answer your more immediate problem, to connect your 5.25in drive to your Electron you will need two products. First you need to attach a Plus 1 or Rombox Plus, which provides interfaces for a printer and joystick, together with two rom cartridge sockets.

It is the rom cartridge sockets that are needed, because the Advanced Plus 4 or Pegasus disc interface sits inside either socket and has a cable connector into which you can plug your disc drive.

The Plus 1 unit is available from Advanced Computer Products and costs £49.95. An alternative to the Plus 1 from ACP is the Rombox Plus from Slogger, which offers much the same features and costs £54.95.

The Plus 4 disc interface is available from Advanced Computer Products, price £79.98, and Pegasus is available from Slogger at £74.95. You are therefore looking at a total cost of approximately £135 to interface your disc drive.

Satisfied customer

I WOULD like to take the time to thank you for your fast and efficient mail order service, and for the excellent Electron User *magazine you produce. The magazine is varied, balanced and supportive to the needs of Electron owners.*

As there are no Electron dealers in New Zealand your advertisements are the sole source of add-ons and are to be highly praised. Thanks again, and continued success for the rest of 1988 – **A. J. Carroll, Wellington 4, New Zealand.**

Odd little error

I HAVE just been going through the programs on February's cassette, and have found an error in Odd One Out.

I find that after 15 questions, and before any winner has been found, I get the message Subscript at line 380. *I have listed this line, but it appears to be as printed in the magazine, and the version on the other side of the cassette yields the same result.*

I am afraid that my programming skills are not up to sorting this one out, so I hope that you will be able to publish a correction in due course, as this game looks to be a useful addition to the selection of programs for my class of seven year-olds.

By the way, I am looking forward to trying Rainbow with them next week. Thanks for a good magazine. – **Mrs Pauline Clayton, Streetly, Sutton Coldfield.**

● Thank you for pointing out this error to us. The bug crept in at the last minute as a new enhancement was being tested, but the hard fix used to test the enhancement – which actually causes this error – was not removed before publication.

To correct the program fully, list line 150 and find the part which reads:

```
done%(15)
```

which you can find immediately before the RESTORE command. Change it to:

```
done%(maxq%)
```

and all will be well. Our apologies for any inconvenience this has caused.

Ram Board games

IN the February 1988 issue of Electron User *Martin Reed suggested that arcade games could be released for use with Slogger's Master Ram Board, making full use of the extra 32k on offer.*

However, this is, I believe, not so simple. Arcade games, unlike adventures, usually poke the screen memory directly. This is not possible when using the Ram Board or a second processor.

All graphics commands have to be executed legally, thus greatly reducing both the game's speed and any advantage which the additional ram provides.

If I am wrong, and this problem can be overcome,

then I must urge people to write to the software houses and show them what a lucrative market this could be.

It would be easy to include 64k enhanced versions of a game on the same tape or disc as the standard version. – **Peter Davey, Reading, Berkshire.**

● While it is certainly possible to read and write to the extra 32k in the Master Ram Board – see Part II of Chris Nixon's shadow ram series in this issue – it must be said that sprite handling, for example, could never be quite as fast as normal.

For those of you with the E2P second processor from PMS, there is a legal osword call which allows byte transfer across the tube.

Again it's not quite as fast as accessing the screen directly, but with tightly-written code this technique is certainly practical.

Look at the Master 128 version of Stryker's Run, for instance. Most of the Master's 64k of sideways ram is used to store the scrolling background – and there is no discernable difference in speed from the original version, although a special call must be used to access data stored in this way.

View editing with tape

ALTHOUGH I seldom use View for writing programs, since they cannot be tested, I often use it for editing. However, tape users obviously cannot use the Strip program given in the article, as it has two files open simultaneously.

But there is an easy solution. As your strip routine (sounds naughty!) clearly demonstrates, the first five spaces on a Basic line are reserved for the line number.

We can therefore instruct View to search for and replace a carriage return and the next five characters with just a carriage return:

```
CHANGE/"C"?"?"?"?"?"?/"C/
```

This effectively removes all the line numbers, except for the first, which for some reason appears indented. Thus tape users need no longer be denied the pleasure of View editing.

By the way, I think you should also have mentioned that any Basic lines longer than 132 characters will have their ends chopped off.

Referring briefly to your answer to my letter in the same issue concerning the Mandelbrot set, perhaps you could remind your readers that in a high resolution mode you can fool the Electron into thinking that it is in Mode 6 with:

```
?&FE07=&38
```

The picture goes haywire, but the program will run at twice the speed. When the picture is finished, a simple:

```
?&FE07=&282
```

will restore the screen to normal. In INKEY command could be used to toggle between the two states – shades of the ZX-81!

Finally, there was an answer to the reader with the power socket problem in Micro Messages a few years back. The socket wobbles slightly and this cracks the copper on the PCB.

The solution is to thicken this area with some solder after first scraping off the green solder resist. This also happened to me. – **Phillip A. Bender, Sunderland.**

Letterhead upgrade

MAY I thank you for your excellent Letterhead Generator program from the March 1988 issue of Electron user.

However, when I ran the original program I found that the cassette filing system messages were being saved as part of the screen. Therefore I have added a new line 35 to disable these messages while the program runs.

I also found that when the program ended after the print routine, or after quitting, the cursor keys did not return to their normal function.

So I have added a new procedure, PROCnormal, *which will reset the cursor keys and turn the cassette messages back on.*

From the short listing shown, add all lines other than 650 and 810 to the original program.

If you have a Brother M-1009 printer, add lines 650 and 810 as well. They contain extra VDU codes which allow the program to work properly with this printer.

```
  35 *OPT 1,0
 180 IF G=32 PROCnormal:END
 190 IF G=31 PRINT TAB(0,5)
STRING$(40," "):PROCscreen_d
ump:PROCnormal:END
 650 VDU 2,1,27,1,65,1,8,1,
27,1,50
 810 VDU 1,27,1,65,1,12,1,2
7,1,50,3
 840 DEF PROCnormal
 850 *FX4
 860 *OPT 1,1
 870 ENDPROC
```

Ravenskull revisited

WITH reference to the map for Ravenskull Level 2, published in the December 1987 issue of Electron User, *I have spotted a mistake in an otherwise excellent map.*

A red scroll is shown in the key as a speed scroll. Although this scroll is also marked on the map, it doesn't actually appear until level four. – **Andy Johnson, North Cotes.**

Electron on the airwaves

I HAVE an Electron with Master Ram Board, a Plus 1 and ACP's Advanced Plus 3.

My first question involves interference with an FM stereo radio, whenever the computer is in action.

I have had two Electrons, and the first had no accessories apart from a First Byte joystick interface. Now it has been replaced due to an irreparable fault, and the interference continues.

This therefore cannot be a problem unique to one faulty Electron. The radio and computer are plugged into separate ring mains, and different TVs have even been tried.

Can you give me a method for preventing this interference, other than not using the radio at the same time as my Electron?

My second question: Is Slogger's T2P3 tape to disc converter for the Plus 3 compatible with my AP3? – **S. Payne, Spixworth, Norwich.**

● Unfortunately there is not a lot than can be done to cure your noisy Electron. We have come across this problem several times before, and all of the usual cures for unshielded RF emissions are impractical when it comes to implementing them on an Electron.

For instance, the standard cure of carefully wrapping the main board in baking foil is very dodgy – even if short-circuits were avoided by first wrapping thin foam around the PCB, the Electron would certainly overheat.

One thing you could try is to shield all your cables fully. There may be enough current to induce a magnetic field in the wires, which in turn may be interfering with your radio's reception.

To answer your second question, T2P3 does indeed work with ACP's Advanced Plus 3.

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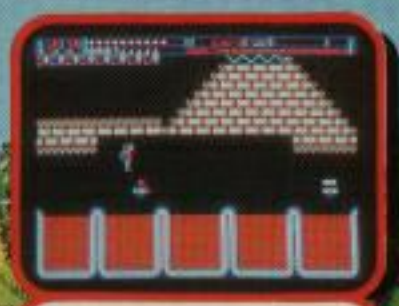

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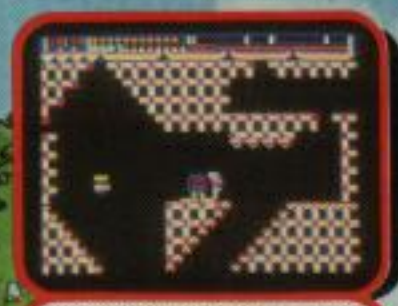

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